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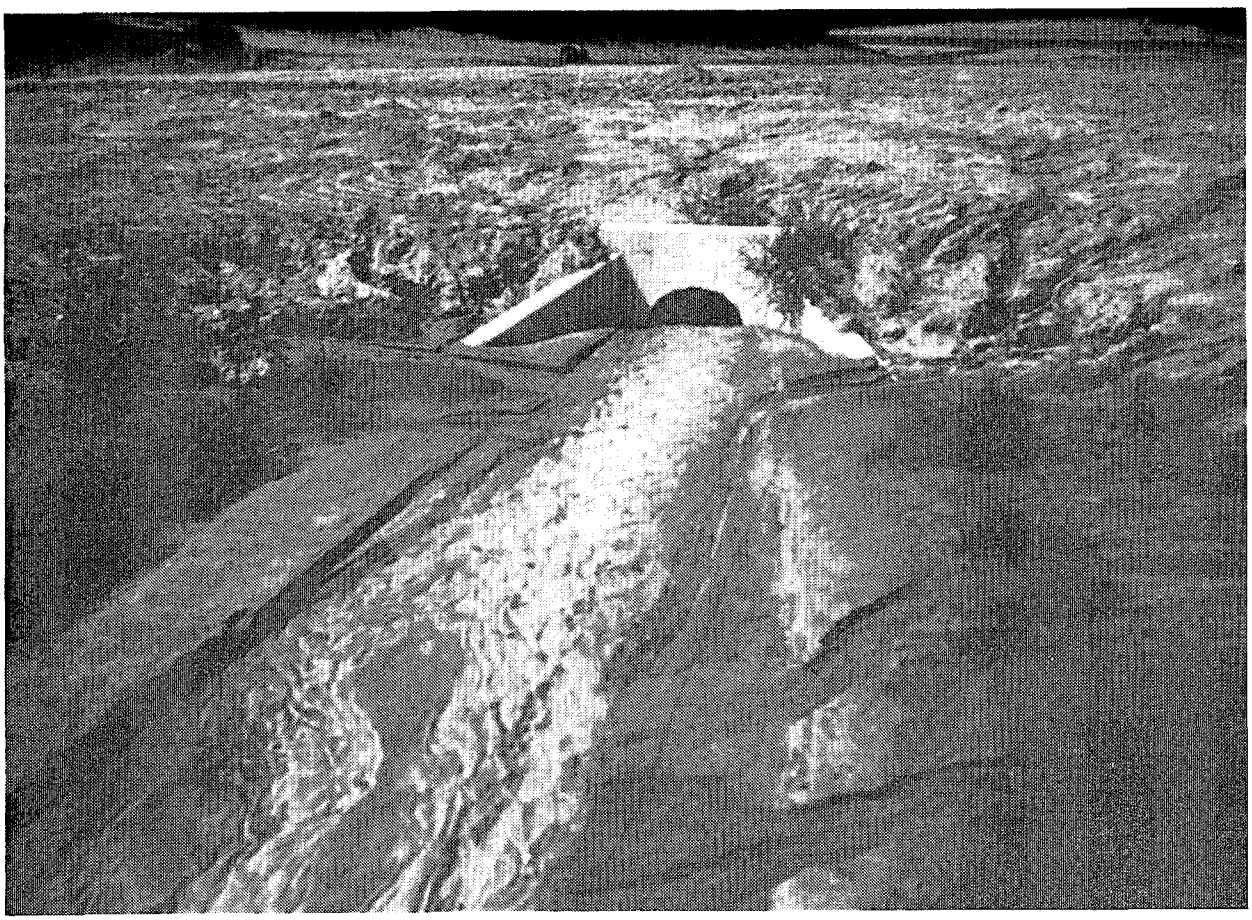
NONPOINT SOURCE MANAGEMENT PROGRAM

For The State Of

SOUTH CAROLINA



April, 1989

South Carolina Department of Health and Environmental Control
Bureau of Water Pollution Control
2600 Bull Street
Columbia, SC 29201

NONPOINT SOURCE MANAGEMENT PROGRAM

STATE OF SOUTH CAROLINA

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South Carolina Department of Health and Environmental Control

August 1988

(Revised April, 1989)

Prepared by

the

Water Quality Planning and Standards Section

Bureau of Water Pollution Control

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Office of the Governor

CARROLL A. CAMPBELL, JR.
GOVERNOR

POST OFFICE BOX 11369
COLUMBIA 29211

May 1, 1989

Mr. Greer Tidwell, Regional Administrator
U.S. Environmental Protection Agency, Region IV
345 Courtland Street
Atlanta, Georgia 30365

Dear Greer:

The South Carolina Department of Health and Environmental Control has completed the Statewide Nonpoint Source Management Program in accordance with Section 319 of the Federal Clean Water Act. The document recommends best management practices (BMPs) to control nonpoint source pollution identified in the state's Nonpoint Source Assessment and the programs that will be used to implement those BMPs. An opinion from the General Counsel of the Department concerning the adequacy of State law to carry out the program is included.

This Management Program is hereby submitted to you for approval in fulfillment of Sec. 319 and EPA regulations. A summary of public participation activities can be found in Chapter XVIII. Opportunity for public comment on the Plan was given by the Department and EPA. Comments were received and considered for inclusion in this revised document.

If you have any questions, please contact Mr. John McMillan of my office or Mr. Douglas Fable, NPS Coordinator, Environmental Quality Control, Department of Health and Environmental Control.

With best regards, I am

Sincerely,

Carroll A. Campbell, Jr.
Governor

CAC;jr/jdh

enclosures

EXECUTIVE SUMMARY

Nonpoint source (NPS) pollution, in South Carolina, is described as pollution contained in stormwater from agricultural, urban, forested, and other land uses. NPS pollution emanates from diffuse sources in contrast to "point" sources which are discharged through a pipe or outlet. Both surface and groundwater may be impacted by NPS. More than 330 waterbodies or portions of waterbodies in the State are estimated to be impacted by some form of nonpoint source pollution.

The South Carolina Nonpoint Source Management Program describes how the State will address NPS pollution problems identified in a companion document titled Assessment of Nonpoint Source Pollution (SCDHEC, 1988). Technology based best management practices (BMPs) and regulatory controls are the tools most widely used for controlling NPS, thus improving water quality.

The State NPS Management Program fulfills certain requirements of P.L. 100-4, the Clean Water Act Amendments of 1987, by listing BMPs used to control NPS pollution, identifying agencies and their programs that will be used to implement the BMPs, targeting priority watersheds for NPS control efforts, and outlining a four-year action plan. These components are discussed for seven categories of NPS pollution that are believed to impact South Carolina waters. They include agriculture, forestry, construction, urban runoff, mining, land disposal, and hydrologic/wetlands modification.

A major part of the Program is evaluation of its effectiveness. One method of evaluation is the completion of well-designed water quality and biological monitoring investigations. Biological studies, physical/chemical sampling, and predictive modeling will be carried out on selected waterbodies to indicate NPS impacts and water quality improvements.

The key to South Carolina's NPS management strategy is the participation and cooperation of the several State, local, and federal agencies that are responsible for NPS related management programs. Their roles are spelled out in the Program. Also, representatives of agencies and groups with an interest in nonpoint source control make up a State NPS Task Force. This body provides direction for the Program and review of outputs.

Educational programs and information campaigns play an important role in the overall strategy. Citizens must be educated about their responsibility in controlling NPS pollution and contributing to the maintenance and improvement of water quality. Technical assistance and demonstrations will be provided to landusers in applying best management practices. Informational campaigns will be directed at the general public in an effort to reduce and clean up NPS pollution.

Finally, sources of funding are identified. Funds from a variety of State, local, and federal sources will be combined and utilized to implement the Program. It is pointed out that the unavailability of federal funds would be an obstacle to implementation of many of the activities to control NPS that are discussed in the Program.

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I. INTRODUCTION

The Federal Clean Water Act established the goal that all waters of the United States should be fishable and swimmable. The State of South Carolina, recognizing this goal, included the following policy as part of the South Carolina Water Pollution Control Act (S.C. Code of Laws 48-1-10, 1976):

> "It is declared to be the public policy of the State to maintain reasonable standards of purity of the air and water resources of the State, consistent with the public health, safety and welfare of its citizens, maximum employment, the industrial development of the State, the propagation and protection of terrestrial and marine flora and fauna, and the protection of physical property and other resources. It is further declared that to secure these purposes and the enforcement of the provisions of this Act, the Department of Health and Environmental Control shall have authority to abate, control, and prevent pollution."

Traditionally, efforts to attain this goal through improved water quality have been directed toward the treatment of point source problems, such as municipal and industrial effluents. In recent years though, it has become increasingly evident that pollution caused by nonpoint sources (NPS) is one of the major contributors to water quality degradation.

Nonpoint source pollution is caused by diffuse sources that are not generally regulated and are normally associated with stormwater runoff from farming and forestry activities, urban development, and construction activities. Nonpoint source pollution does not result from a discharge at a specific point source (such as a single pipe) but generally results from land runoff, precipitation, atmospheric deposition, or percolation. Thus, NPS pollution has an adverse impact on both surface and groundwater.

Typically, NPS pollution occurs in the following manner. When land is

disturbed, especially sloping land, and then precipitation occurs, some of the loosened soil is washed toward the nearest waterbody. Soil particles and stormwater itself may carry pollutants such as bacteria, nutrients, and pesticides and other toxic materials which can ultimately reach the stream, lake, or estuary. Pollutants could also enter the groundwater through percolation or seepage.

Nonpoint source pollution creates many of the same water quality problems as point source pollution. Heavy metals, pesticides, and other toxic chemicals washed off streets, farms, and lawns can cause adverse impacts to fish and other aquatic wildlife; decomposition removes dissolved oxygen necessary for the survival of valuable fish species; and nitrates and other nutrients can cause extensive algae blooms or the rapid eutrophication of lakes and estuaries.

Also the vast amounts of sediment released from nonpoint sources can cause a host of other problems--covering spawning beds of fish, exacerbating flood damage, and filling in reservoirs, drainage ditches, and irrigation canals.

Nonpoint source pollution can also cause serious groundwater contamination problems. Nitrates and some pesticides can seep into groundwater from cropland and suburban lawns. Leakage from septic tanks and seepage from chemical spills, landfills, and a host of other sources can contaminate shallow groundwater supplies. Many other of the same sources that affect surface water can affect groundwater as well, particularly if the contaminants dissolve in water. Finally, some of the measures that can be taken to lessen surface water pollution may result in making groundwater contamination more serious.

Recent amendments to the Federal Clean Water Act mandate that States assess nonpoint source pollution and commence a management program to control and abate it by August 1988. To meet this federal mandate, the South Carolina Department of Health and Environmental Control has embarked on a three stage program to

conduct a comprehensive NPS assessment, develop management strategies, and implement these strategies.

A separate Assessment Report of NPS problems in South Carolina was prepared, and this Management Program document describes what will be done by the State in the next four years to address NPS problems. It includes recommendations of best management practices (BMPs) to control impacts on the waterbodies named in the Assessment and the programs, both regulatory and non-regulatory, that will be employed in order to implement the BMPs.

The State of South Carolina is committed to nonpoint source pollution control. The NPS Management Program will be implemented to the furthest extent possible using available sources of funding, i.e. EPA grants appropriated under the Clean Water Act Amendments and available State funds. Funding for implementation will also be sought through the various federal, State, and local agencies with programs related to NPS control and integrated into the State's NPS Management Program.

II. MANAGEMENT STRATEGY

The Clean Water Act of 1987 (CWA) states:

> "It is the national policy that programs for the control of nonpoint sources of pollution be developed and implemented in an expeditious manner so as to enable the goals of this Act to be met through the control of both point and nonpoint sources of pollution."

This goal focuses on the importance of controlling nonpoint sources of water pollution. With the enactment of Section 319 of the CWA, new direction and significant federal financial assistance for the implementation of State nonpoint source (NPS) programs has been authorized. The CWA requires two major reports to be completed by August 4, 1988: a State Assessment Report describing the State's NPS problems and a State Management Program explaining what the State plans to do in the next four fiscal years to address their NPS problems. The CWA authorizes financial assistance for developing these reports and for implementing the State's NPS Management Program.

To meet this federal mandate, the Environmental Protection Agency promulgated final guidance in December 1987 that elaborated on the requirements of Section 319 of the CWA. A major part of this guidance refers to the Management Program. This portion is exhibited in Appendix 1. The guidance states that State Management Programs shall include six categories of information:

1. Best management practices and measures which will be used to reduce pollutant loadings resulting from each category, subcategory, or particular nonpoint source designated in the State's Assessment Report, taking into account the impact of the practice on groundwater quality.

2. Programs (including, as appropriate, non-regulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects) to achieve implementation of the best management practices designated above.

3. A schedule containing annual milestones for utilization of program implementation methods and implementation of best management practices by the categories, subcategories, or particular nonpoint sources designated in the State's Assessment Report.

4. A certification by the attorney general of the State or States (or the chief attorney of any State water pollution control agency which has independent legal counsel) that the laws of the State or States, as the case may be, provide adequate authority to implement such management program.

5. Sources of Federal and other assistance and funding [other than assistance provided under subsection (h) and (i)] which will be available in each of such fiscal years for supporting implementation of such practices and measures.

6. The federal financial assistance programs and federal development projects for which the State will review individual assistance applications or development projects for their effect on water quality pursuant to the procedures set forth in Executive Order 12372.

South Carolina's NPS Program incorporates these requirements.

In the fall of 1987 the South Carolina Department of Health and Environmental Control (the State's Water Quality Control Agency) applied for and received EPA funds to commence the NPS effort. The first phase of this effort involved the preparation of a statewide assessment report that described existing and potential NPS problems. A draft version of the Assessment was

submitted to EPA in June 1988 and simultaneously made available for public review and comment. It lists over 300 waterbodies that are believed to be impacted or potentially impacted by nonpoint source pollution. The list is presented in Appendix 2. It includes the water quality problems associated with the impact such as nutrients, toxic materials, or bacteria contamination, and the source (or category) of the impact such as agricultural or urban stormwater runoff.

Our management strategy is two pronged. DHEC will coordinate the implementation of programs on a watershed level based on the prioritized list of targeted waterbodies found in Chapter III of this document. Participation by all agencies and groups having programs to deal with NPS problems identified in the watershed is essential. Depending on the nature and extent of the NPS problem(s) and the makeup of the watershed, a mix of BMPs selected from those recommended in this document (or others if shown to have a favorable impact on water quality) will be implemented through applicable federal, State, and local programs. Types of programs include technical assistance, regulation enforcement, financial assistance, and education/information. Local coordination of program implementation will be stressed; in most cases the local Conservation District will be the key contact with the District Conservationist providing leadership in assisting the District. Public involvement will be sought. Awareness programs will be implemented and aimed at landowners/landusers and other members of the public residing within the watershed. Schedules identifying target dates for accomplishing tasks over the next four fiscal years will be prepared.

We will also recommend and implement general NPS programs to include education, technical, and financial assistance and regulations that are applicable statewide. Progress in implementing the program will be described

via annual reports to EPA/Congress, and periodically updated NPS Assessment and Management Plan documents.

The South Carolina Department of Health and Environmental Control is charged with the responsibility of implementing the NPS program mandated in Section 319 of the Clean Water Act and with protecting water quality in the State. DHEC will assure that the NPS Management Plan is implemented so as to meet federal and State water quality goals. However, due to the many federal, State, and local agencies involved with nonpoint source control, a successful program will depend on a partnership between DHEC and these other agencies. DHEC will serve as the lead agency for all seven identified NPS categories but has requested that the cooperating agencies assist in completion of the various categorical plans.

A Nonpoint Source Task Force has been formed to make recommendations of the content and implementation of the Management Program. It is composed of representatives from governmental agencies having programs related to nonpoint source control, water quality, or water resources. The group held its first meeting on July 22, 1988, and provided helpful guidance on Management Program preparation. The Task Force has met several times since then and will continue to meet on a regular basis during the life of the NPS program. The group has identified a list of targeted waterbodies scheduled to receive high priority for implementation programs.

Nonpoint source assessment and management are an integral part of Water Quality Management (208) Planning. Nonpoint source was comprehensively addressed as part of the South Carolina Water Quality Management Plan, completed in the late 1970's. The current Assessment Report and Management Program serve to update the NPS portion of the Water Quality Management Plan. Therefore, they will be incorporated into the State's 208 Plan upon approval by the Environmental Protection Agency.

III. TARGETING AND MONITORING WATERBODIES/WATERSHEDS

Objective

South Carolina's NPS Assessment report lists the waterbodies or segments of waterbodies in the State that are impacted (or potentially impacted) by nonpoint source pollution. This Assessment list and a legend appear in Appendix 2. Because of fiscal and time constraints, it is necessary to select a subset of waters for concerted action over the next four years. Such targeting provides the greatest opportunity for achieving water quality improvements. The guiding principle in targeting the State's waters using priority ranking is to maximize environmental and use benefits by devoting resources to control NPS in a priority order that recognizes the values of the waterbody in question, the benefits to be realized from various control actions, and the controlability of the problem(s). Selected waterbodies may include those already impacted by NPS pollution or high quality waters where a potential for degradation without NPS management exists.

Given the limited resources available to effectively solve all the NPS problems identified, targeting waterbodies/watersheds is an important component of South Carolina's NPS program. Targeting establishes a prioritization for implementation of NPS efforts. By focusing on a smaller number of watersheds, water quality improvements will be more recognizable and support for the NPS program will be more likely to succeed. As the cooperating agencies work through the list of targeted watersheds, those remaining will be prioritized in a similar manner.

Procedures for Targeting Waterbodies

Initially in the NPS program, a methodology was developed by DHEC NPS staff to prioritize the waterbodies/watersheds named in the Assessment. This methodology relied on three overall factors, each given a numerical rating:

1. Waterbodies with degradation by NPS based on data from DHEC's ambient water quality monitoring network - A severity index was devised based on the number of violations of various criteria such as dissolved oxygen, nutrients, and or bacteria, and the severity of the violations.
2. Watersheds with a high potential for erosion - Highly erodible watersheds were indicated by a computer generated model and assigned a numerical value based on the severity of the erosion.
3. "High quality" waterbodies that are threatened by NPS - "High quality" waterbodies included Outstanding Resource Waters (ORW) such as trout streams and coastal shellfish waters, and waterbodies of other State of South Carolina classifications that were attaining their designated uses. A numerical value was assigned based on the water's classification.

This methodology produced a ranked list of twenty-six waterbodies. It was not used, however, because of several built-in shortcomings. First, the methodology excluded waterbodies without monitoring stations or that are classified by name. Secondly, coastal plain and coastal waterbodies tended to be under-represented because of less potential for erosion. Thirdly, the methodology did not satisfactorily account for non-numerical factors such as public support, likelihood of implementation, existence of other programs, etc. Therefore, the collective knowledge and expertise of the State Nonpoint Source Task Force was called upon to target high priority waterbodies/watersheds. The

following selection criteria were developed by the working group. The criteria included:

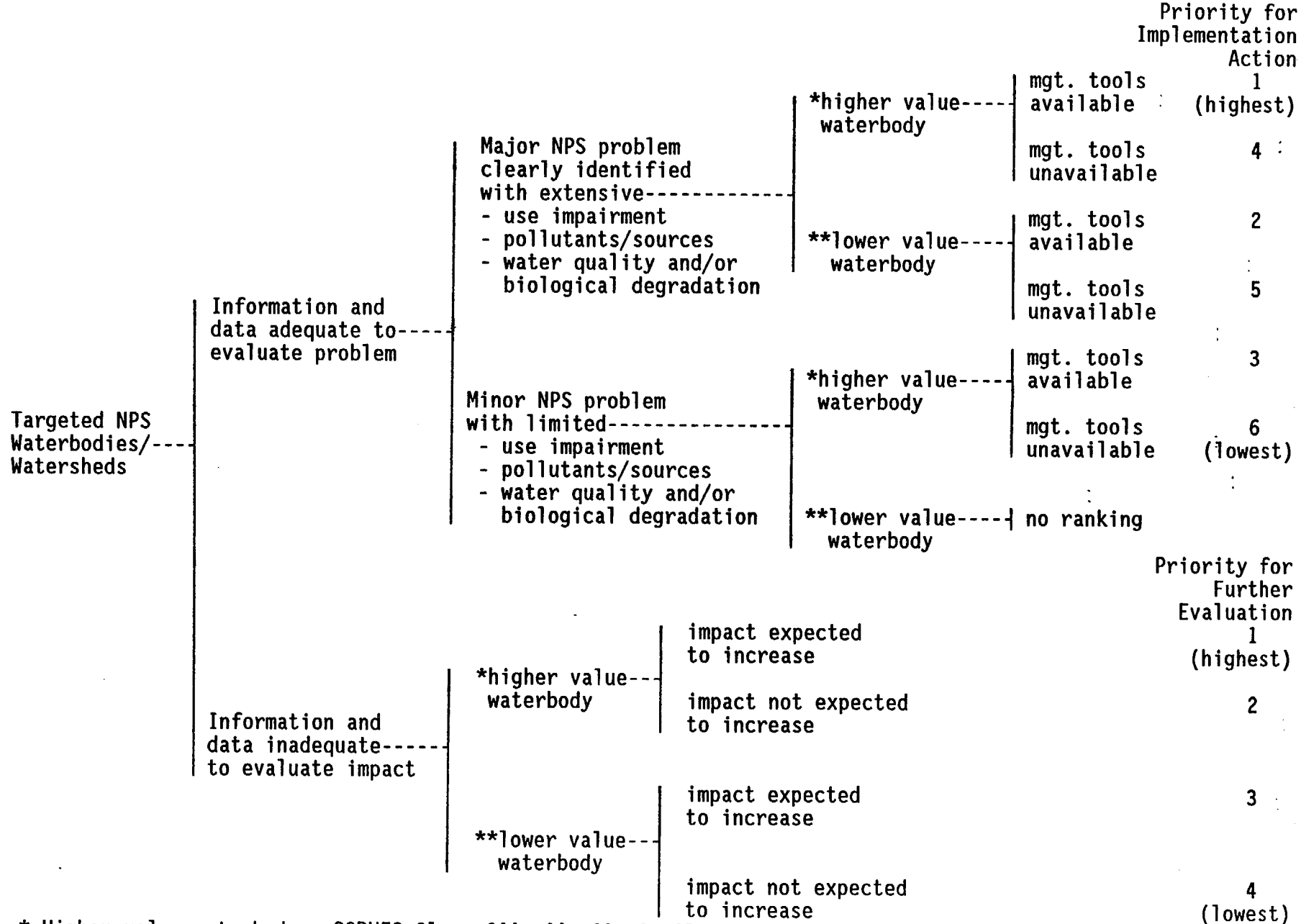
1. Waterbodies/watersheds where severe NPS problems are known to be occurring.
2. Watersheds with some type of ongoing or planned NPS management program such as ASCS Cost Share, PL566, Watershed Protection, 314 Clean Lakes Grant, in-place regulatory program such as local sediment control ordinance, etc.
3. Watersheds with a high potential for runoff.
4. Threatened ORW waters, popular recreational waterbodies, waterbodies used for drinking water supply, wetlands, and watersheds harboring endangered species.
5. Waterbodies prohibited for the collection of shellfish due to NPS pollution.

Taking these factors into consideration, the Task Force generated two lists of targeted waterbodies/watersheds. The first list contains the names of waterbodies/watersheds where adequate information and/or data are available to indicate a NPS problem and implementation plans could immediately commence. There are twenty-five waterbodies/watersheds on this list. The second list contains the names of watersheds or larger drainage basins where evidence of NPS pollution problems exists, but further evaluation or assessment is needed before implementation plans could commence. By necessity, large drainage basins would be broken down into smaller watershed units. There are twenty-one watersheds included on the second list.

A decision-tree analysis, shown in Figure 1, was then employed to prioritize the two lists. The final two lists exhibit in priority order the waterbodies/watersheds targeted for implementation of control programs (Table 1) and further evaluation (Table 2). Watershed identification numbers (ID#) are

FIGURE 1

PROCESS FOR PRIORITIZING TARGETED WATERBODIES IN NPS ACTION PLANS



* Higher value waterbody = SCDHEC Class SAA, AA, SA, A, SB
** Lower value waterbody = SCDHEC Class B, SC

TABLE 1

WATERBODY/WATERSHEDS TARGETED FOR IMPLEMENTATION ACTION

	Name	Watershed ID#
Group 1 (First Priority)	Lake Bowen	03050105
	Camping Creek	03050109
	Kinley Creek	03050109
	Murrells Inlet	03040207
	Salkehatchie River	03050207
	Lower Saluda River	03050109
Group 2 (Second Priority)	Black Creek	03040201
	Gills Creek	03050110
	Intracoastal Waterway (Horry County)	03040206
	Long Cane Creek	03060103
	Lynches River	03040202
	North Pacolet River	03050105
	Reedy River	03050109
	Scape Ore Swamp	03040205
Group 3 (Third Priority)	Beaverdam Creek	03060102
	Upper Coosawhatchie River	03050208
	Halfway Swamp	03050111
	Pawleys Inlet	03040207
	South Fork Edisto River	03050204
	Three Creeks	03040201
Group 4 (Fourth Priority)	Lake Wylie	03050101
Group 5 (Fifth Priority)	Ashley River	03050202
	Clark Sound	03050202
Group 6 (Sixth Priority)	Chauga River	03060102
Group 7 (No Rating)	Brushy Creek	03050109
	Clouds Creek	03050109

TABLE 2

WATERBODIES/WATERSHEDS TARGETED FOR FURTHER EVALUATION

	Name	Watershed ID#
Group 1 (First Priority)	Chattooga River	03060102
	Lake Marion	03050111
	Trenchards Inlet	03050208
	Tugaloo River	03060102
	Wadmalaw Sound	03050205
Group 2 (Second Priority)	Congaree Creek	03050110
	Edisto River Basin	03050205
	Lake Lanier	03050105
Group 3 (Third Priority)	Crowders Creek	03050101
	Jeffries Creek	03040201
	Little River (Fairfield Co.)	03050106
	Little River (Laurens Co.)	03050109
	Sampit River	03040207
	Lower Savannah River	03060109
	Smith Branch	03050106
	Tyger River	03050107
Group 4 (Fourth Priority)	Broad River Diversion Canal	03050106
	Enoree River (Newberry Co.)	03050108
	Lake Greenwood	03050109
	Little Pee Dee River	03040204
	Stevens Creek	03060107

also provided in Tables 1 and 2. These IDs correspond to those given in the Hydrologic Unit Map for South Carolina prepared by the U. S. Geological Survey. Those listed in group 1 have the highest priority, those in group 2 the next highest, etc. The lists are not static and may change over time. The nature of the targeting process allows for adjusting priorities based on new data or information. The NPS Task Force will provide for periodic review and revision of the two lists as needed.

Monitoring and Assessment

The waterbodies or watersheds targeted for the implementation of management strategies and BMPs include streams, rivers, lakes, estuaries, and wetlands (Table 1). Being located throughout South Carolina, these aquatic ecosystems are naturally diverse with respect to their physiography, hydrology, biological community and habitat structure, and chemical/physical water quality characteristics. The diversity of nonpoint source categories, impacts, and pollutants indicate that flexible site-specific procedures are critical for NPS monitoring and assessment. The success of this monitoring program is dependent upon well defined, measurable goals and objectives. The primary goals of monitoring in targeted watersheds will be to:

1. Evaluate, using biomonitoring and water quality based approaches, the presence and degree of NPS related biological (aquatic life) and habitat impairment, and/or water quality degradation. Once impairment/degradation is detected, additional monitoring (biological/physical/chemical) is usually necessary to identify the cause of the problem, pinpoint its source or sources, and implement appropriate controls. After controls are in place, biomonitoring again becomes important for evaluating the ultimate effectiveness of such controls.

2. Evaluate and verify the effectiveness of NPS management strategies and BMPs in producing positive environmental results. Positive environmental results include significant biological (aquatic life), habitat or water quality/groundwater improvements; gains toward use attainability; use maintenance or protection in existing high quality waters; and significant reductions in NPS pollutant loads or instream concentrations. It is understood, however, that the time required to demonstrate positive environmental results may often exceed four years, which is the time frame specified in Section 319 for the 1987 Clean Water Act

Effective implementation of such a multi-faceted monitoring approach requires that various monitoring techniques be considered within a large context of water resource management. Both biological and chemical methods have critical roles to play in a successful NPS pollution control program. They should be considered complementary rather than mutually exclusive approaches that will enhance overall program effectiveness. Thus emphasis will be placed on the development and application of a flexible and integrated biomonitoring and water quality based procedure. In targeted waterbodies, evaluation of biointegrity using biosurveys will be emphasized over traditional efforts which have focused on chemical monitoring for assessing regulations related to point source permits and concentrations of toxic chemicals.

Some of the advantages of using biomonitoring for addressing program objectives are:

1. Biointegrity, or a balanced biological community, is probably the best indicator of overall waterbody health (ecological integrity). From an ecological perspective, a high quality biological community can only occur in a high quality chemical/physical environment. Conversely,

waterbodies exhibiting biointegrity can be assumed to have chemical and physical integrity.

2. Biomonitoring (biosurveys, toxicity testing) provides a practical tool for assessing toxic impacts on aquatic life for the over 120 priority pollutants now regulated. For many of these pollutants, analytical methods are either too crude or expensive to detect ambient concentrations that are potentially harmful.

3. Assessing impacts from nonpoint sources requires a monitoring approach which integrates the effects of both long-term, low-level pollutant inputs and unpredictable but potentially catastrophic pulses. Biological communities integrate the effects of different pollutant stresses, and thus provide a total measure of the aggregate impact. Communities also integrate the effects of stress over time, and thus provide a single measure of fluctuating environmental conditions. This capacity of biological communities to integrate the effects of highly variable inputs makes them a particularly useful tool for monitoring nonpoint source impacts and the effectiveness of certain Best Management Practices.

4. In times of dwindling resources, there is increasing public and legislative pressure to rationalize pollution control expenditures in terms of environmental results. This requires the targeting of resources, through screening and priority setting, on clear problems, then documenting the resolution of these problems in terms of demonstrable improvements. Biointegrity is a direct, comprehensive indicator of ecological conditions, and as such, may be the best measure of both water quality impairment and pollution control effectiveness.

5. Routine monitoring of biological communities can be relatively inexpensive, particularly when compared to the cost of assessing chemical specific toxic pollutants, either chemically or with toxicity tests.
6. The status of biological communities is of direct interest to the public as a measure of pollution control effectiveness, while reductions in chemical pollutant loadings are not as readily accepted by the layman as positive environmental results. For example, citizens in general are more likely to understand information about the condition of a fish and macroinvertebrate community than data on biochemical oxygen demand, nutrients, or suspended solids.
7. Where chemical specific parameters for measuring ambient impacts do not exist (e.g., nonpoint source impacts that degrade habitat or cause flow alterations) assessing biological communities may be the only rational means of evaluating controls.
8. In situations where specific chemical stress agents are either too esoteric or too varied to assess individually, bioassays can be used to either focus specific chemical investigations or to characterize generic stress agents such as stormwater or effluent toxicity.

These advantages strongly support the primary use of biosurvey methods for monitoring. However, in the NPS pollution control process, identifying the causes and limiting sources will require some chemical and physical data. These data are needed to:

1. Identify the specific stress agents causing impact. This can be a relatively simple task; but given the array of potentially important pollutants (and their possible combinations), it is likely to be both difficult and costly.

2. Identify and limit the specific sources of these agents. Although biosurveys can be used to help locate the likely origins of impact, chemical analyses and/or bioassays are usually necessary to confirm the responsible sources and develop appropriate discharge limits.
3. Design appropriate BMPs or treatment to meet the prescribed limits and monitor compliance.

In summary, the nonpoint source monitoring program in targeted watersheds will involve a flexible site-specific approach. Procedures will focus on biomonitoring, habitat, and water quality evaluation. Biomonitoring may involve one or more taxonomic groups including fish, macroinvertebrates, or algae. Selection will be based on the advantages of using a particular group(s) for the targeted waterbody and the objectives being assessed. One of three types of monitoring designs may be employed to deal with sampling and statistical analysis. These monitoring designs include:

1. Before and after time trend - this design aims to show a decrease in biological or water quality impact over time, following NPS pollution control implementation.
2. Above and below - this design assumes that the biota or water quality above and below the influence of a NPS pollutant source should be the same unless the pollutant concentration is higher below the source. Upstream variability and the NPS pollution source can be documented with this design.
3. Paired watershed design - this design assumes similar hydrologic and land use areas for two watersheds. Simultaneous monitoring, a calibration period, and at least one control are required. Advantages are that meteorological variability is controlled, monitoring is minimized, and a short time is required to document change. Also, land treatment can be strongly linked to water quality improvement.

Major disadvantages include the need for similar drainage patterns in each watershed and coordination among those planning and implementing the project.

Within each of the monitoring designs outlined above, effort will be made to incorporate the "Ecoregion Concept" into the assessment process. Geographic patterns of similarity among ecosystems are called ecoregions. The different ecoregions are determined by environmental variables such as climate, soil type, physiography, and vegetation, which vary across the country. Naturally occurring biotic assemblages, as components of the ecosystem, would be expected to differ among ecoregions but be relatively similar within a given ecoregion. The ecoregion concept thus provides a geographic framework for more efficient management of aquatic ecosystems and their components. This, in turn, implies that similar water quality standards, criteria, and monitoring strategies are likely to be valid throughout a given ecoregion, but should be tailored to accommodate the innate differences among ecoregions.

Substantial data on biological assemblages in South Carolina, such as those available through the S. C. Department of Health and Environmental Control and the S. C. Wildlife and Marine Resources Department can be integrated and used to establish optimal biological criteria within each ecoregion. While such criteria may not be as important if an unimpacted control station can be sampled, when a synoptic ("snapshot") survey is being conducted or an appropriate control does not exist in the immediate study area, use of idealized criteria may be the only means of discerning use impairment or assessing impact or improvements.

One method of demonstrating water quality improvement through increased implementation of both structural and management BMPs is monitoring pollutant loadings from specific sites where practices have been implemented. Such evaluation may show not only that BMPs are effective in preventing sediment

runoff, etc. but will also be cost effective in the long run. Monitoring efforts of this type are described in the Agricultural Four Year Action Plan.

Another method of assessing NPS impacts is through predictive modelling. A model can analyze past data, assess present conditions, or project future needs. A water quality model can predict NPS impacts in a waterbody based on quantified inputs. A Geographic Information System (GIS) is a computerized model that can incorporate large volumes of spatial data into a single or series of outputs which, subsequently, can be used to make predictions. Land use data from satellite images, aerial photographs, or maps are entered into the computer by importing or digitizing the datasets and storing them in the computer. The computer records the digitized features as a series of X,Y coordinates and, using the GIS software, converts the data into grid cells. These are then analyzed to depict contributions of the various land areas to nonpoint source pollution. The model can identify, delineate, and rank land areas with the highest NPS impacts on a waterbody and provide a basis for relating water quality measurements to land conditions within watersheds so that predictions concerning water quality in a watershed can be made.

Planned Activities

The Santee Cooper Project, a Division of DHEC's Bureau of Water Pollution Control will study NPS pollution contributions to Lake Marion, a large reservoir in lower South Carolina, and their impacts on lake water quality. The study will be carried out under contract with researchers form the University of Georgia Laboratory for Remote Sensing and Mapping Science.

The purpose of this study is to develop a technique that can be used in other watersheds. It will be used as a model and pilot project for similar assessments statewide. The methodology can easily be generalized to other watersheds, and none of the components of the simulation are specific to the Lake Marion drainage area in conceptual design.

The overall objective of the pilot study is to generate map products and statistics for the land areas contributing sediment, fertilizer, and toxic input to the Congaree and Wateree Rivers and to Lake Marion. These data will then be used to establish a modelling approach for assessing the impact of nonpoint source pollution of the wetlands bordering the rivers and on the quality of water and aquatic macrophyte growth in Lake Marion.

The recommended technical approach involves four steps: (1) collection of SPOT satelite image data, available aerial photographs and topographic and soils maps of the study area; (2) development of land use/cover maps of the study area by automated digital classification of the SPOT data; (3) integration of the land use/cover data with soil and slope information to create an ARC/INFO geographic information system (GIS) database for map production and modelling of nonpoint source pollution; and (4) development of statistics and derived map products that clearly depict critical areas and quantify nonpoint source pollution inputs to the wetlands and Lake Marion. Each of these steps is briefly summarized in the following paragraphs.

Topographic (1:24,000 scale) and solid (1:15,840 scale) maps of the study area will be provided by DHEC. Multispectral SPOT image data in digital format will be obtained from SPOT Image Corporation.

The watershed study units in order of priority are understood to be as follows:

1. Congaree-Wateree Rivers

   These units extend southward from Columbia and Camden to Lake Marion and include the wetlands along the Congaree and Wateree Rivers. The total area is about 3,100 km^2 (1,200 mi^2).

2. Lake Marion

   This unit includes Lake Marion and its surrounding watershed. It encompasses approximately 1,400 km^2 (540 mi^2).

Land use/cover maps of the watershed units will be prepared from the SPOT 20 m multispectral data by computer-assisted classification techniques. The following land use/cover classes will be employed:

1. Forest
2. Urban
3. Agriculture-fallow
4. Agriculture-vegetated
5. Water
6. Wetland

For each watershed study unit, a GIS database with layers for soils, slope, and land use/cover will be constructed and referenced to the Universal Transverse Mercator (UTM) coordinate system. Soils data will be digitized from existing USDA soils maps, whereas slope information can be computed from digital elevation models (DEMS) developed from the 1:24,000 scale USGS topographic maps or by photogrammetric means from high altitude aerial photographs. In addition, information on precipitation will be collected for incorporation into the database.

Maps of 1:50,000 or 1:100,000 scale will be produced for each of the layers in the database by computer-assisted cartographic techniques using the ESRI pc ARC/INFO GIS software available at the LRMS. The database and maps will document soils, slope, and land use/cover conditions at the outset of the study and provide the basis for the preparation of statistical and derived map products indicating areas of high runoff, critical soil erosion, and toxic waste.

The layered database of soils, slope, and land use/cover data, in conjunction with information on precipitation and pollutants will be analyzed using GIS techniques to develop map products and statistics depicting contribution of the land areas to nonpoint source pollution. To perform this

analysis, individual polygons in the soils, slope, and land use/cover data layers will be weighted according to their contribution to nonpoint source pollution. The weighted polygons will then be aggregated to create a composite map of polygons color-coded according to their impact on water quality. A similar procedure has been previously documented by Slack and Welch (1980).

These derivative map products and statistics will allow DHEC personnel to identify, delineate, and rank land areas impacting wetlands along the Congaree and Wateree Rivers. It will also provide a basis for relating ground measurements of water quality to land conditions within the watershed and permit projections on sedimentation, macrophyte growth, and water quality in Lake Marion. The study is estimated to last eighteen months, meaning that results will be available early in 1991.

IV. ADMINISTRATION AND COORDINATION OF THE NPS MANAGEMENT PROGRAM

Due to the several categories of NPS pollution, there are a wide variety of agencies and programs available to control it. A successful NPS Management Program will require the cooperation of the numerous federal, State, and local agencies and the involvement of the general public. The NPS lead agency, the Department of Health and Environmental Control (DHEC), NPS staff will serve as the program coordinator and liaison among these groups and will also serve as Program administrator.

Because of the number of separate activities involved and the diffuseness of the problem, there will inevitably be the need for the refinement and adjustment of the NPS Management Program. Feedback, once implementation has begun, will indicate areas where fine tuning is necessary. The DHEC NPS staff will work with the cooperating agencies and the State NPS Task Force to evaluate effectiveness and direction of the Program. If evaluation indicates a need, mid-course corrections will be made in a feasible, publicly acceptable, and cost-effective way.

The following specific tasks are the responsibility of DHEC NPS staff and are to be implemented over the life of the Program.

1. Assure Plan implementation through:
    a. Provision of assistance to cooperating agencies toward implementing specific categorical programs;
    b. Coordination of implementation projects in targeted watersheds;
    c. Continued use of the NPS Task Force to assist with policy decisions.

d. Provision of communication and coordination between NPS Program staff and regulatory Divisions of the Department's Office of Environmental Control in order to promote compliance with the NPS Management Program. These Divisions include, but are not limited to, Industrial and Agricultural Wastewater, Domestic Wastewater, Water Quality and Shellfish Sanitation, and Bureau of Solid and Hazardous Waste.

2. Evaluate effectiveness of the Program and implement mid-course corrections. Based on the evaluation, consider replacing voluntary programs with regulatory programs.

3. Develop and implement water quality monitoring programs to further define NPS impacts and to evaluate effectiveness of NPS best management practices and control measures.

4. Develop and implement general NPS educational programs and information campaigns employed to inform the public on NPS issues and encourage the use of BMPs.

5. Develop and prepare annual workplans and grant applications for the expenditure of EPA funds used to implement the Program. Actively seek funds from other sources that would complement the Program.

6. Prepare and submit annual progress reports, updated Assessment Reports, and others as needed.

7. Implement "federal consistency" provisions of the Program.
   a. Review proposals from federal agencies that impact this program for consistency.
   b. Make comments where necessary.
   c. Assure that comments are addressed by federal agency.

V. OVERALL PROGRAM GOALS AND MILESTONES

As described in this report, many agencies and organizations are currently involved in the development and implementation of the South Carolina NPS Management Program. It is a dynamic program, and the number of participants is expected to increase. In particular, local government, special interest group, and public involvement will increase as implementation proceeds.

Individual schedules of annual goals and milestones are included in a four-year action plan to implement the program. Each agency having primary responsibility for the various NPS categories has included a schedule containing annual goals and milestones for their specific NPS category. For example, the S. C. Land Resources Conservation Commission will have primary responsibility for mining activities in the State and has provided a schedule of annual milestones in the mining section of this report.

In addition to the individual schedules of annual goals and milestones, the following schedule outlines the overall goals and milestones of the NPS Assessment/Management Program. This is a tentative schedule, and it may be revised periodically over the four-year program.

Goals/Milestones

	Calendar Year				
	1988	1989	1990	1991	1992
1. Prepare and submit to the EPA a draft NPS Assessment Report	X				
a. Identify State and local programs for controlling NPS pollution					

	Calendar Year				
	1988	1989	1990	1991	1992
b. Describe process for identification and selection of BMPs					
c. Identify State waterbodies impacted by NPS pollution and the sources of such pollution					
d. Identify navigable waters which do not support designated uses if NPS pollution controls are not implemented. Also, identify high quality waters potentially impacted by NPS if BMPs were not implemented.					
2. Prepare and submit to the EPA a draft NPS Management Program Report to include the following functional components	X				
a. Participation of the public and NPS related management agencies					
b. Program Management/Policy Development					
c. Education/Information/Demonstration Projects					
d. Monitoring and Research					
e. Technical/Administrative/Financial Assistance					
f. Regulation and Compliance					

		Calendar Year				
		1988	1989	1990	1991	1992
3.	Identify programs to achieve implementation of BMPs on Statewide basis	X	X			
4.	List BMPs used to reduce pollution loadings for each NPS category and, as necessary, develop new BMPs for each NPS category	X	X			
5.	Develop an integrated/cooperative strategy for selecting and funding targeted watersheds	X	X			
6.	Develop integrated program for selecting, reviewing, and funding research projects	X	X			
7.	Finalize and obtain EPA approval on the State's NPS Assessment Report		X			
8.	Finalize and obtain EPA approval on the State's NPS Management Program Report		X			
9.	Prepare a NPS annual progress report		X	X	X	X
10.	Assess and increase public awareness of NPS water pollution	X	X	X	X	X
11.	Encourage voluntary use of BMPs for non-regulated categories of NPS pollution	X	X	X	X	X
12.	Develop and implement new educational, technical assistance, demonstration, and financial assistance programs for each NPS category	X	X	X	X	X

		Calendar Year				
		1988	1989	1990	1991	1992
13.	Enforce regulations, permits, and contract conditions concerning NPS pollution control and the use of required BMPs	X	X	X	X	X
14.	Determine if new programs, laws, or regulations should be considered for each NPS category	X	X	X	X	X
15.	Develop a Statewide groundwater monitoring network to assess NPS pollution impacts and water quality improvements resulting from BMP implementation	X	X	X	X	X
16.	Develop and implement a comprehensive and flexible biological and water quality monitoring program to evaluate the impact of NPS pollution and the effectiveness of BMPs in improving degraded water quality or preventing NPS impacts	X	X	X	X	X
17.	Select target waterbodies/watersheds for implementation of NPS management and abatement projects		X	X	X	X
18.	Evaluate improvements/benefits in biological communities and/or water quality, or water use in targeted watersheds		X	X	X	X
19.	Determine numbers and types of BMPs implemented by NPS category		X	X	X	X

		Calendar Year				
		1988	1898	1990	1991	1992
20.	Evaluate and revise, as necessary, programs for each NPS category		X	X	X	X
21.	Evaluate overall effectiveness of the NPS Management Program through water quality and water use benefits/improvements			X	X	X

VI. AGRICULTURAL NPS MANAGEMENT PLAN

Introduction

Agriculture in South Carolina is a diverse industry. Production includes conventional row crops, fruits and vegetables, livestock and poultry, freshwater fish, and horticultural crops. In 1987 there were 2,031,000 acres of crops harvested in South Carolina, which constituted 11 percent of the total land area of the state and meant $489,030,000 in raw product sales.

Livestock production has a large economic impact on the state. In 1987 there were 17,000 cattle farms with a total of 620,000 head which included all cows and calves. Of that amount there were a total of 284,000 production brood cows. Also during 1987 there were 200 dairy farms with 44,000 milk cows which produced 547 million pounds of milk. In addition, there were 11,500 hog farms in the state with 39,000 sows which produced 584,000 pigs.

Poultry also continues to have a significant impact on South Carolina agriculture. In 1987, 1.6 billion eggs were produced from 6,305,000 layers, ranking South Carolina thirteenth in the nation for total egg production. South Carolina poultry farmers also produced 68,051,000 broilers and raised 3,950,000 turkeys in 1987. Total sales of livestock and poultry are shown in Table 3.

TABLE 3

ECONOMIC VALUE OF LIVESTOCK AND POULTRY

Production	1987 Value ($1,000s)
Cattle	$275,900
Milk	85,214
Hogs	28,600
Eggs	69,507
Broilers	72,134
Turkeys	37,210
	TOTAL - $568,565

The impacts of agricultural production on surface and groundwater are diverse. The agricultural community continues to diversify to meet market demands and economic pressures. Sources of nonpoint source pollution originate from land use and production activity. In South Carolina, herbicides, pesticides, fertilizers, animal wastes, and sediment are potential sources of nonpoint source pollution. The management of land use activities involving agricultural production affects nonpoint source pollution. For example, application of herbicides and pesticides for row crop production can affect surface water runoff depending on the amount and timing of application. Therefore, management practice, type of production, and control practices used can affect agriculture's contribution to nonpoint source pollution.

There are a number of impacts that can be associated with nonpoint source pollution. The Assessment of Nonpoint Source Pollution for the State of South Carolina listed over 332 water bodies that are believed to be impacted by nonpoint source pollution. There are 217 water bodies listed in the category as impacted by agricultural nonpoint source pollution. There are 280 watersheds in the state (SCS Hydrologic Unit Map). Of these, 53 have 50 percent or greater land use for agricultural production. Nonpoint source problems range from muddy water in waterbodies to fish kills and adversely polluted drinking water supplies. Clean water is an important and necessary natural resource. Economic and environmental considerations must be given to the development of agriculture in South Carolina so that it can remain a viable industry in the state.

State and federal agencies have joined as a team to compile their resources and expertise to develop this Management Plan for agriculture. Figure 2 shows the flow path of each organization in developing this plan. Input was obtained as shown from each agency; efforts were made to channel existing programs into the areas of water quality and nonpoint source pollution abatement. The concept of the plan calls for the maximum use of all existing programs and the development of new programs where they are needed when funding is available.

FIGURE 2

Agricultural Nonpoint Source
Management Plan Development

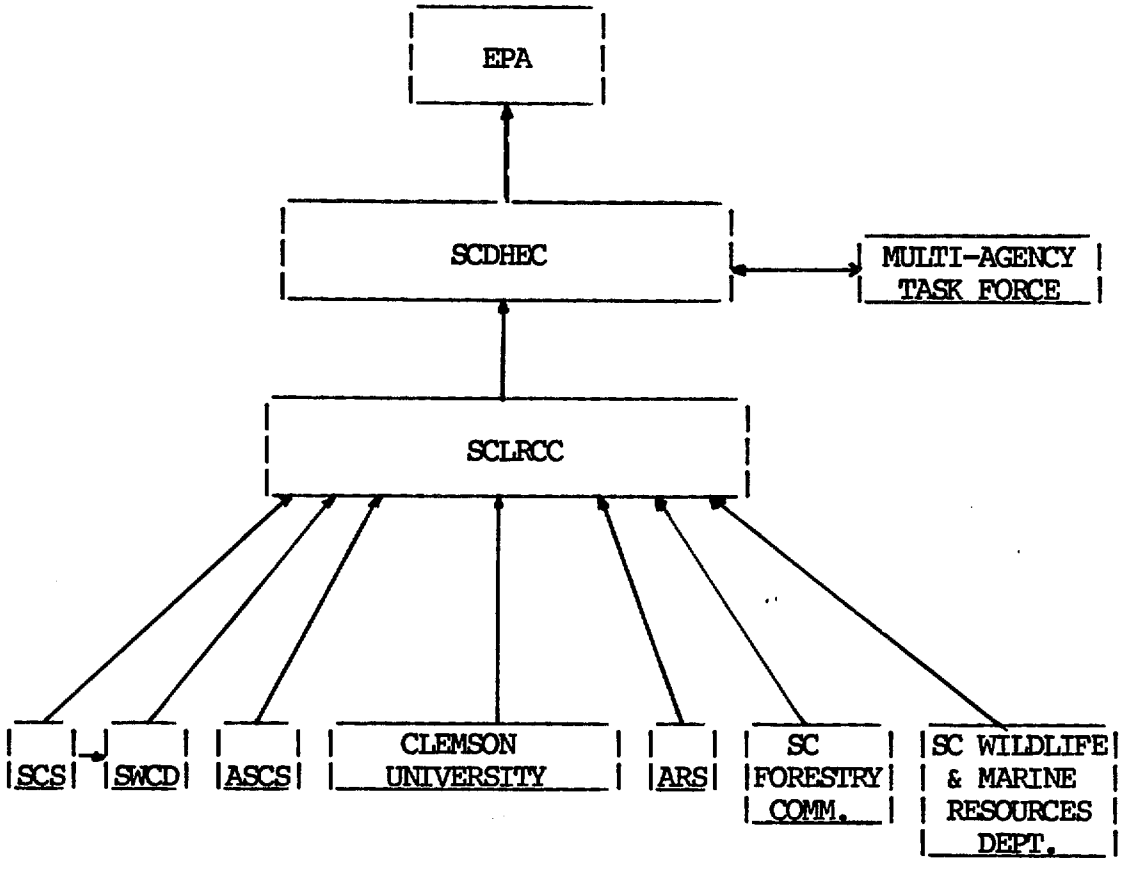
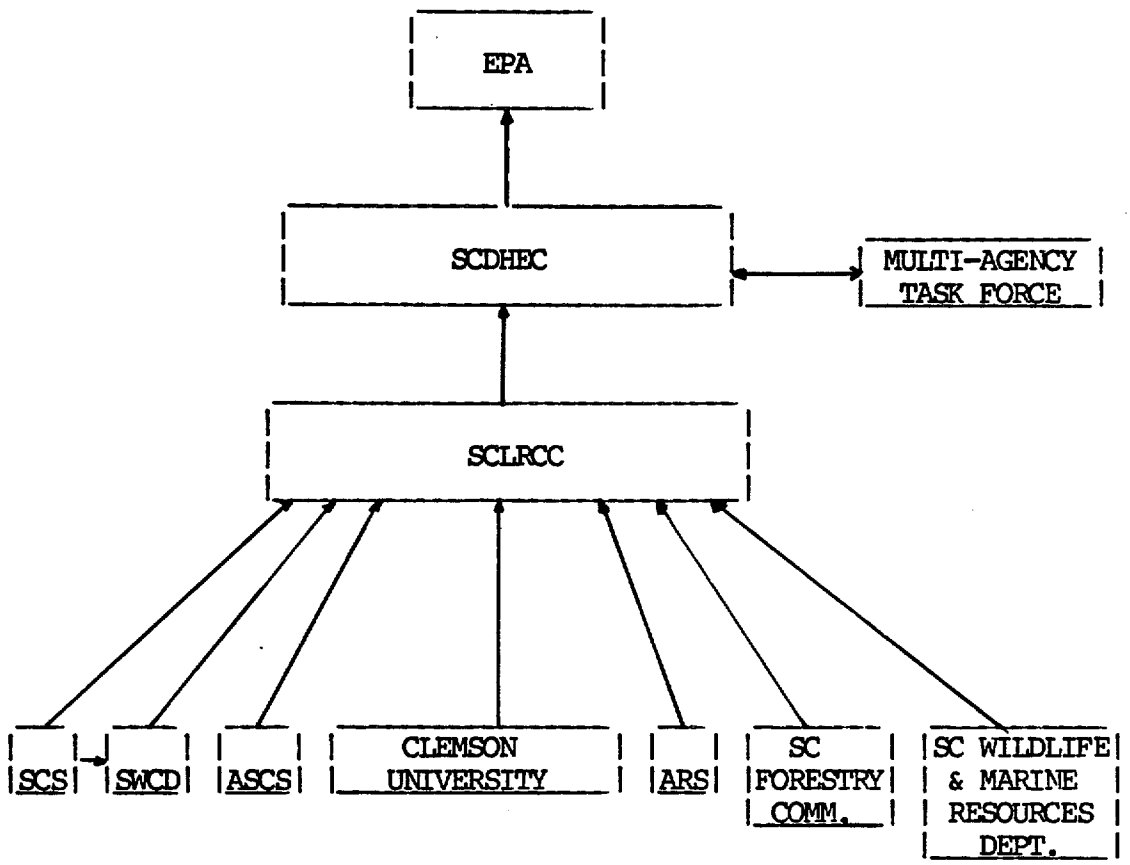


FIGURE 2

Agricultural Nonpoint Source
Management Plan Development



Agricultural NPS Problems

The impact of nonpoint source pollution from agriculture on surface and groundwaters of South Carolina is unclear due to lack of quantitative data. Many waterbodies were identified in the assessment as potentially impacted, all or in part by agricultural nonpoint source pollution. Of the 217 water bodies identified, 123 based on land use are impacted exclusively by agricultural nonpoint source pollution. These were determined either by monitored or evaluated data. The other 94 water bodies which were identified have agricultural land uses as well as other land uses within the watersheds which may serve as a contribution to the pollution problems. It is difficult to separate these causes. However, most nonpoint source problems can be associated with the following descriptions of pollutants:

* Sediment

Sediment pollutes by filling channels, streams, and reservoirs, impeding the passage of sunlight through water, and hindering microscopic plant growth. It also transports pollutants such as chemicals, nutrients, and pesticides. It may clog the gills of fish, smother macroinvertebrates, or otherwise interfere with biological activities of living organisms in water. Furthermore, sediment causes excessive wear on pumps, valves and gates used in water control systems.

* Nutrients

Nitrogen (N) and phosphorus (P) are significant nutrients in terms of NPS pollution because of their effect on plant growth in surface waters and the possible resulting degradation of these waters for recreation, industry, irrigation, and as a drinking supply.

Nutrients in the soil are part of very complex cycles. Fertilizers are among several sources of nutrients necessary for plant growth. Rainfall and organic matter are natural inputs. Nutrients from natural sources are

susceptible to the same transformations as nutrients from fertilizers and can be retained or leached from the complex biological-environmental system.

Proper use of fertilizers to achieve maximum yields and correct application rates and schedules do not appear to contribute to water pollution. Problems from nonpoint source pollution are more likely to arise from excessive application rates or improper timing of application.

* Pesticides

The primary requirement for any pesticide is control of the target organism. In response to the need for pest management in agriculture, there have emerged a large number of synthetic organic compounds which control a broad spectrum of undesirable insects, plants, and plant pathogens.

The most significant causes of nonpoint pollution from agricultural pesticides are from wind and water erosion, and on the farm practices of handling pesticide containers and dilute rinse solutions. Since most pesticides are largely bound to organic matter and clay in the soil, most movement from the application site in the field to surface water is by soil erosion. Losses of surface applied pesticides are many times greater in periods immediately following application than a week or more later. Nutrient and pesticide losses are closely correlated to soil management practices.

* Animal Wastes

Management of animal waste has received considerable attention in recent years as potential sources of pollution. Potential pollutants in animal wastes include fecal coliform bacteria, nitrogen, phosphorus, potassium, and organic matter. This concern was stimulated because of the trend toward large confined livestock and poultry units which result in increased accumulations of manure and other wastes. In South Carolina, NPS pollution from animal wastes has been

noted in some watershed. The sources include runoff from feedlots, earthen exercise or watering areas, pastures, and fields on which manure is spread. Groundwater contamination has also been identified as being associated with agricultural waste treatment lagoons.

* Impacts of Certain Agricultural Best Management Practices on Groundwater

Some of the best management practices being utilized today in the agricultural nonpoint source category are designed to prevent or reduce erosion and sediment-bound nonpoint source pollutants. Protection of the soil surface by residue cover from raindrop impact and runoff is highly effective in reducing soil loss and sediment loads. During the last decade, there has been a major shift by U. S. farmers away from inversion tillage, such as moldboard plowing, toward systems with reduced tillage. Conservation tillage is defined as a form of non-inversion tillage that retains 30 percent of residue mulch on ground surface throughout the year.

This practice has been shown to be effective in decreasing erosion and sediment loads from agricultural land including sediment-bound nonpoint source pollutants. The ability to achieve significant reductions in these important pollutants has led to the promotion of conservation tillage as a best management practice for nonpoint source pollution control that can benefit the farmer, conserve the soil resource, and protect the environment.

However, increasing use of conservation tillage has caused considerable concern relative to potential contamination of groundwater by nitrates and pesticides. This concern primarily revolves around three issues: (1) Does residue cover in conservation tillage reduce surface runoff and increase

infiltration, with a resulting potential increase in groundwater contamination by soluble agricultural chemicals, chiefly nitrate and some pesticides? (2) Does elimination of tillage for weed control increase use of herbicides that may leach to groundwater? (3) Does increased residue cover provide a refuge for insects which will increase insecticide use?

These questions regarding the environmental soundness of this important BMP are significant considering the large quantities of agricultural chemicals used by farmers and because of the high mobilities of nitrate and some of pesticides in soil. Research has been conducted on conservation tillage in the United States since the early 1960's and various systems have been developed for use by farmers since the late 1960's. Many of the assertions made about potential environmental effects of conservation tillage have resulted from a tendency to generalize regarding effects observed over a wide range of soil, climate, crop, and tillage management conditions.

Many of the effects on the environment attributed to conservation tillage are based on research which compared the two extremes of the tillage continuum--clean inversion tillage and no-till. Conservation tillage as practiced by many farmers involves much less residue corer than no-till, perhaps closer to the minimum of 30 percent cover by which conservation tillage is defined. The degree of tillage can greatly reduce the differences between no-till and inversion tillage of soil properties and processes that affect environmental quality.

The primary concerns mentioned earlier are countered by claims that reduced runoff occurs only on more permeable soils with low hydraulic conductivities; that the rates and kinds of herbicides used in conservation tillage are no different than those used with clean tillage; and that pest control can be achieved with integrated pest management programs and crop rotations without an increase in insecticide use. Additional field study and modeling are needed in

South Carolina to evaluate the groundwater impacts and other NPS aspects of conservation tillage and other BMPs.

Existing Program Descriptions

* South Carolina Land Resources Commission

The South Carolina Land Resources Conservation Commission (LRCC) is the implementing agency for the S.C. Erosion and Sediment Reduction Act (Ch. 18, Title 48, Code of Laws 1976) and, as such, is designated as the State agency responsible for developing, coordinating and promoting erosion and sediment reduction in the State. Under the law, the Commission must develop general guidelines for reducing erosion and sedimentation to be used by conservation districts, local governments, landowners and users in the state; publicize and promote these guidelines through education and information programs; conduct surveys, investigations and assessments of erosion, sediment, and stormwater problems; make available technical assistance upon request to local governments, landowners and users; and promulgate regulations on erosion and sediment reduction and stormwater management on land owned and managed by the State.

In addition, LRCC administers the South Carolina Soil and Water Conservation Districts Law and assists in the implementation of State Conservation Tax Credit legislation. Through the Soil and Water Conservation Law, the LRCC coordinates the activities of the 46 Soil and Water Conservation Districts (SWCD) and implements soil and water conservation programs in conjunction with SWCD, local governments, and other entities through educational, technical, and financial assistance.

The South Carolina Watershed Conservation District Law authorizes the creation of Watershed Conservation Districts (WCD). Fifty-eight WCDs have been established pursuant to the Law. Each WCD lies within a specific watershed and is a subdivision of State government. They are organized under the supervision

of Soil and Water Conservation Districts with the LRCC providing technical and administrative assistance.

State Conservation Tax Credit legislation provides State income tax credits for the purchase of conservation tillage planters and drip irrigation and for the construction and restoration of water impoundments including those for the purpose of erosion and sediment control. The LRCC developed technical criteria for the South Carolina Tax Commission for implementation of this legislation and provides technical and regulatory assistance to landowners and users in the planning and installation of the practices. Applicants for the water impoundment tax credit must either obtain a construction permit (pursuant to the S.C. Dams and Reservoirs Safety Act) from LRCC on a certificate of exemption which may be issued by either LRCC or the SWCD in which the impoundment is located.

In addition, a $488,158 grant was obtained by the LRCC through Petroleum Violation Escrow funds to provide SWCDs with conservation tillage and drip trickle irrigation installation equipment. Thirty-three conservation tillage drills, 5 conservation tillage planters, and 19 pieces of drip irrigation installation equipment will be available for use by farmers through the SWCDs. A second grant has been requested in the amount of $489,430 for 38 conservation tillage planters and drills and 15 pieces of drip irrigation installation equipment.

These projects enhance LRCC demonstrations of conservation technology. Innovative practices such as reservoir tillage and conservation systems (including interseeding) are currently being tested and demonstrated.

* USDA - Soil Conservation Service Programs

A. Conservation Operations Programs:

Conservation operations programs account for the major part of Soil Conservation

Service (SCS) efforts in South Carolina. Conservation operation programs include the following:

1. Conservation Planning and Application

   The SCS provides technical assistance to landusers at the local level through Soil and Water Conservation Districts (SWCD). Each county in South Carolina has a SWCD. SCS in South Carolina has an office staffed with technical specialists to serve each Conservation District. Technical assistance from SCS involves help to individual landusers in understanding natural resources and natural resource problems, planning for the protection or improvement of natural resources through the use of BMPs, designing BMPs, and supervising the construction of BMPs to ensure proper installation.

   Agricultural Stabilization Service (ASCS) funds may be available to landusers for financial assistance for the application of BMPs planned by SCS. SCS also provides assistance to ASCS with identifying and carrying out special cost-sharing projects for water quality.

   The conservation provisions of the Food Security Act of 1985 have added new emphasis to resource protection. The Conservation Reserve Program (CRP) provides financial incentives to landowners to take highly erodible cropland out of production. Land is put into non-eroding uses such as woodland, grassland, or wildlife land for ten years. Also filter strips may be placed next to streams, and land with scour erosion may be stabilized under CRP for water quality purposes. The Conservation Compliance, Sodbuster, and Swampbuster provisions encourage farmers to meet certain standards under penalty of loss of government payments.

2. Soil Surveys

   Soil surveys have been made in 44 of the 46 counties in the State.

Surveys of the remaining two counties will be completed in 1989. Soil survey reports are available to 36 counties. Each soil survey describes the physical and chemical characteristics of the soils in the county. It names and classifies the soils according to a nationwide system and provides information on the potential and limitations of the soils for various uses. Detailed maps show where each soil is located. In making the survey, soil scientists determine the soils' texture, structure, chemical composition, depth, slope, degree of erosion, and other features that affect their response to various uses and kinds of management. These surveys are essential to planning best management practices. SCS provides funds for soil surveys which are cost-shared with other federal and State agencies.

3. Resource Inventories

SCS conducts inventories of land use and condition and special inventories where needs exist as a part of the National Resource Inventory. A site-specific inventory of erosion problems has recently been made. Environmental values are monitored to determine the impacts of best management practices.

4. The Resource Conservation Act (RCA)

RCA helps set direction for SCS programs through the involvement of the public. Every five years SCS elicits the assistance of all people with developing a new national conservation program.

5. Plant Materials Program

Under the Plant Materials Program, SCS operates plant materials centers throughout the United States to find plants that can help solve soil and water resource problems. Plants are tested locally, then developed for widespread use.

B. Water Resources Programs:

SCS cost-shares in the form of technical and planning assistance or construction cost for most of the water resources programs offered. Water resources projects include river basin studies, flood plain management studies, and P.L.-566 Small Watershed Projects. Land treatment watershed projects are included as part of P.L.-566 Flood Control for Small Watersheds. Through this program, SCS provides financial assistance to landusers in addition to technical assistance for the installation of BMPs. There are thirteen active land treatment watersheds in South Carolina. The S. C. Water Resources Commission provides assistance to the Governor for administration of water resources programs. By Executive letter, the Commission is responsible for review, prioritization, and approval of planning starts for P.L.-566 projects in South Carolina.

C. Resource Conservation and Development (RC&D) Program

The purpose of RC&D is to provide help to communities with economic development through the wise and environmentally safe use of natural resources. Rural development activities are carried out under RC&D. There are four RC&D areas in operation in the State. Each area has a coordinator supplied by SCS, and specialists in all disciplines help with this program. Each RC&D area is directed by a council of Soil and Water Conservation District Commissioners and local government leaders who provide guidance for the program. Much of the work is done through the cooperation of many agencies, groups, and individuals. Many projects undertaken through RC&D are directly related to reduction of nonpoint sources of pollution. SCS funds are available for RC&D technical assistance and for cost-share for construction projects.

* Clemson University

Clemson University, the State's land grant institution, conducts several activities directly related to nonpoint source pollution. The research program in the College of Agriculture develops new technology for environmentally sound

agricultural production. In addition, data for these new practices are collected and analyzed. For example, the integrated pest management program and the Low Input Sustainable Agricultural program complement the nonpoint source management plan. Both of these programs are developing practices to enhance water quality and reduce production costs. In concert with research programs is the Cooperative Extension Service. The link between these two entities is the Experiment Stations where a large portion of research is conducted. The Extension Service provides technical assistance and serves as a vehicle for technology transfer through educational demonstrations and individual contact with farmers.

The Clemson Extension Service has established committees (i.e., Land and Water Resources) to address the emphasis on water quality. For example, they are providing training to farmers for conservation compliance under the 1985 Farm Bill. By establishing core groups of professionals within the University, Clemson is able to concentrate and target its program through extension and research to areas affected by nonpoint source pollution. This can be accomplished on the local level through the County Extension Office. The local Extension Office can coordinate with other local entities to target problem areas. Educational information on sound environmental practices is distributed through local extension offices.

Included under the Public Service programs offered through Clemson University is the administration of the South Carolina Fertilizer Law, Liming and Materials Act, Pesticide Control Act, and Chemigation Act. The Department of Fertilizer and Pesticide Control at Clemson University is responsible for education of the public and enforcement of these Acts.

The Fertilizer Law and Liming and Materials Act are designed to ensure the quality of lime and fertilizer received by the consumer. The Pesticide Control Act regulates storage, sale, use, quality control, and numerous other areas.

The Chemigation Act regulates application of chemicals through irrigation equipment.

Under Rules and Regulations of the South Carolina Pesticide Control Act, all applicators who apply restricted use pesticides, all pesticide dealers, and all structural pest control operators must pass a rigorous licensing examination. The Department has seven pesticide/ fertilizer inspectors who sample the pesticides being sold in South Carolina. These samples are analyzed at Clemson to ensure that pesticides are not misbranded or mislabeled and contain the ingredients stated. Six regulatory specialists and one field supervisor are involved in complaint and compliance inspections regarding pesticide use and enforcement of the Chemigation Act. They inspect pesticide users to ensure that the manner in which pesticides are being used is consistent with label directions, and they also check irrigation equipment to ensure that growers who are chemigating follow the backflow prevention requirements of the Chemigation Act. Pesticide dealers are inspected to ensure that only licensed applicators purchase "restricted use" pesticides. Dealer establishments are inspected to ensure that proper display and storage regulations are followed.

Violators of the Act are prosecuted vigorously. Civil penalties are levied when pesticides are misused. If an individual's health or the environment is in danger, more stringent enforcement matrix parameters are involved. Overall compliance with the act by members of the agribusiness industry has been excellent.

The Clemson Department of Fertilizer and Pesticide Control believes that education is a key to preventing violations of the Act and contamination of the environment. Therefore, a great deal of effort is utilized through preventative education including instruction of pesticide applicators on proper pesticide application techniques.

In an effort to improve its education and enforcement capabilities, this Department has pursued external sources of funds where possible without decreasing the flexibility of the pesticide program. These efforts have resulted in two grants from the Environmental Protection Agency. The Department has also made a concentrated effort to increase efficiency by using state-of-the-art data management.

In 1987, 771 companies registered 7,928 pesticide products for sale in South Carolina. A total of 956 pesticide samples were collected and analyzed; five were found deficient in the guaranteed percentage of one or more ingredients. Stop-sale notices were issued on all deficient products. Registration fees totalling $135,307 were deposited. Pesticide specialists made frequent contact with the pesticide users community which included dealers, growers, applicators, and consumers.

The structural pest control area requires particular attention. Chlordane and Heptachlor were removed from the marketplace. Inspections with dealers and meetings with pest control operators were scheduled as necessary to assist with this transition. The Chemigation Act increased regulatory efforts to protect groundwater and much effort was directed into this area.

Recertification of pesticide applicators began in 1989. This program requires that pesticide applicators obtain ten additional contact hours of pesticide training in ten areas: calibration and maintenance of application equipment, groundwater protection, worker safety, chronic toxicity and ways to reduce exposure, transportation and disposal of pesticides, label interpretation, new pesticide technology, new pesticide application technology, chemigation, protection of endangered species. It should be noted that groundwater and chemigation are two areas of primary importance in training pesticide applicators. There are over 1,900 commercial and non-commercial applicators and 10,000 private applicators who will participate in the

recertification program. Private applicators must complete five contact hours of training in similar recertification topic areas. This widespread move to educate applicators in protecting groundwater will help reduce the possibility of groundwater contamination in South Carolina. The Department of Fertilizer and Pesticide Control will continue to work with the Clemson University Cooperative Extension Service in these training efforts.

Regulations are being developed at this time for the Chemigation Law. Essentially these regulations will further detail steps growers must take to ensure groundwater contamination does not occur when using fertilizers or pesticides in irrigation water. A brochure has been developed for growers who are chemigating.

* USDA - Agricultural Stabilization and Conservation Service

ASCS administers several programs which are directly related to nonpoint source pollution problems. ASCS has the responsibility for administering the following programs:

1. The Agricultural Conservation Program (ACP) provides financial incentives and technical assistance to encourage agricultural producers to voluntarily perform enduring soil and water conservation and pollution abatement measures. The program is administered in all South Carolina Counties by local ASCS County Committees who are elected by producers in the County. The Soil Conservation Service provides technical assistance to landowners under this program. Conservation practices for the ACP have been developed at the national level by the National Conservation Review Group. State and county practices are selected from the list of national practices, and specifications for practices are developed in consultation with State and County Conservation Review Groups. Special practices may be developed at State and county levels, subject to approval at the

national level. Through the ACP, two special water quality projects will be funded during 1989, one in Abbeville County and one in Horry County.

2. The Emergency Conservation Program provides cost-share funds for emergency assistance designed to meet only the critical needs of agricultural producers due to severe drought or other natural disasters. Some of the practices included in the program are:
   a. Removing debris from farmland;
   b. Grading, shaping, releveling, or similar measures;
   c. Restoring structures and other installation;
   d. Emergency wind control measures;
   e. Drought emergency measures.
3. The Forestry Incentives Program provides cost-sharing for eligible landowners to encourage forestry practices that are designed to ensure a continuing supply of timber and timber products. Practices and practice specifications are designed in consultation with State Conservation Review Groups. The South Carolina Forestry Commission provides technical assistance to landowners under this program.
4. The Conservation Reserve Program authorized ASCS to make annual payments to landowners and users under ten-year contracts. The purpose of this program is to convert highly erodible cropland to less intensive use. In South Carolina, this usually means permanent grasses or trees. In addition to annual payments during the ten-year contracts, cost-share payments are made to producers to establish the required cover. The Conservation Reserve Program is conducted through the cooperative effort of ASCS, SCS, soil and Water Conservation Districts, S. C. Commission of Forestry, and the Clemson University Extension Service. SCS determines land eligibility and erosion rates,

develops conservation plans, and certifies practice completion. The U. S. Forest Service, through the S. C. Forestry Commission, develops tree planting plans on designated eligible acres. Soil and Water Conservation Districts review and approve completed conservation plans. The Extension Service assists with information and educational programs related to the program. The Conservation Reserve Program, through 1988, has removed approximately 230,000 acres of highly erodible land from crop production in South Carolina. Continuing registration will be held through 1990, or until the Secretary of Agriculture determines the program has reached the goal set forth under the Food Security Act of 1985.

* ARS - Agricultural Research Service Programs

The Agricultural Research Service (ARS) primarily conducts basic and applied research for agricultural industry. ARS has made significant contributions which apply to South Carolina. The Piedmont area is served by the Research Station in Watkinsville, Georgia, and the Coastal Plains area is served by the Research Station in Florence, South Carolina. Both stations have programs which are related to soil and water management research.

ARS provides applied research in cooperation with university research teams. The programs concentrate on developing new techniques for management of natural resources.

* South Carolina Department of Health and Environmental Control

DHEC's Bureau of Water Pollution Control administers the Agricultural Waste Management Program in cooperation with the USDA Soil Conservation Service. Management of agricultural wastes is rapidly emerging as one of the major problems facing South Carolina farm producers. The use of confinement type houses for the production of eggs, milk, and meat, coupled with confined animal breeding/feeding operations and the discharge of wastewater from peach packing

hydro-coolers tend to intensify waste handling problems and thus increase the probability of causing localized nuisance and NPS pollution problems. To prevent these wastes from entering waterbodies, DHEC required that both solid and liquid agricultural wastes from covered facilities be collected, treated, and disposed of in an environmentally safe manner. This is primarily accomplished through a permitting and inspection program that requires landowners to apply certain best management practices for waste control.

For new operations, DHEC issues a State construction permit to a farm producer and he may request that the Soil Conservation Service provide technical assistance in the design of a waste management plan to fit his operational needs. The waste management plan describes the method of waste disposal. It may call for a simple method of disposal such as spreading on the land utilizing appropriate best management practices or require a more elaborate system such as holding tanks, holding ponds, stacking pads, or lagoons. Any appropriate method of disposal is acceptable provided it is approved by the Department and prevents wastes from degrading the environment. When construction is complete, SCS certifies to DHEC that it meets specifications and DHEC then issues an operating permit. Operating permits may be issued to existing facilities providing they have an approved waste handling and disposal system. DHEC Environmental Quality Control offices conduct periodic inspections to ensure permit compliance.

BMPs for Protecting Water Quality From Agricultural Activities

Best management practices are conservation and management practices which have been demonstrated to effectively control movement of pollutants from a land area, prevent degradation of soil and water resources, and are compatible with the planned land use. Individual best management practices may not provide sufficient control of pollutants to protect the environment. Thus, these practices should be applied as combinations of practices into resource management systems with consideration for erosion control; management of

nutrients, pesticides, and other chemicals; water disposal; resource management; water management; and off-site effects.

The water quality impacts of any practice will vary with specific site conditions and with the other supporting practices in a system of practices. Therefore, planning for water quality improvement must be site-specific and consider the protection of existing water quality (surface and subsurface) as well as the improvement of impaired water quality. In other words, there is no cookbook method of devising BMPs for use in all situations. A great variety of site-specific factors, experience, and good judgement enter into correct planning for water quality protection and improvement. Further, new techniques are constantly being developed. For example, the creation of new wetlands to filter NPS runoff from agricultural areas may be researched and evaluated. Other BMPs will continuously be evaluated requiring that the list be updated periodically.

TABLE 4

BMPS FOR AGRICULTURAL OPERATIONS AND LAND USE

Land Use	Sediment Control	Nutrient Control	Pesticide Control	Bacteria Control
Crop and Pasture Lands	Avoid converting wetlands to agricultural production Chiseling and Subsoiling Conservation Tillage Systems Contour Farming Cover Crops Critical Area Planting Cropland Conversion Diversion Field Border Filter Strip Grade Stabilization Structure Grassed Waterway or Outlet Grasses and Legumes in Rotation Mulching Pasture and Hayland Planting Pastureland Conversion Reservoir Tillage Rock-lined Waterway Row Arrangement Sediment Control Structure Sod-based Rotation Stripcropping Terrace Water Control Structure	Grasses and Legumes in Rotation Nutrient Management or Control	Pesticide Management or Control Avoid spraying pesticides over waterbodies	
Animal Production	Planned Grazing System			Adherence to regulatory guidelines in constructing waste treatment lagoons to minimize adverse groundwater impacts. Grade Stabilization Structure Heavy Use Area Protection Livestock Exclusion or Fencing Spring Development Stock Trails and Walkways Trough or Tank Waste Management System Waste Storage Pond or Structure Waste Treatment Lagoon Waste Utilization or Land Application of Waste Water Control Structure

TABLE 4 (Continued)

BMPS FOR AGRICULTURAL OPERATIONS AND LAND USE

1. Adherence to regulatory guidelines in constructing waste treatment lagoons to minimize adverse groundwater effects.
2. Avoid converting wetlands into agricultural production.
3. Avoid spraying pesticides over waterbodies.
4. Chiseling and Subsoiling

   Deep tillage to shatter compacted soil layers or traffic pans. This BMP permits more effective development of plant roots, increases water infiltration rates and reduces runoff. This practice is most effective on sandy soils with traffic pans. Small storm runoff and erosion is reduced. The practice improves soil drainage and aeration, decreasing the potential for denitrification. This may result in nitrates being leached deeper into the soil. The plant's roots are able to go deeper so the nitrates may still be taken up by the plants. The time of year and extent of plant growth will need to be considered.
5. Conservation Tillage System means a form of non-inversion tillage that retains thirty percent protective amounts of residue mulch on the surface throughout the year. Types of conservation tillage systems include no till, minimum tillage, and interseeding. Generally conservation tillage requires more pesticides and better management skills than conventional tillage. This practice reduces soil erosion, detachment and sediment transport, and transport of nutrients and pesticides attached to sediment by providing soil cover during critical times in the cropping cycle. Surface residues reduce soil compaction from raindrops, preventing soil

sealing, and increasing infiltration. This action may increase the leaching of agricultural chemicals into the groundwater.

6. Contour Farming

Crops are cultivated across slopes with the contours of the land instead of up and down slopes. This BMP includes farming along established grades of terraces or contour strips. Soil loss can be reduced by fifty percent on moderate slopes of two to seven percent and less on other slopes. This practice reduces erosion and sediment production. Less sediment and related pollutants may be transported to the receiving waters. Increased infiltration may increase the transportation potential for soluble substances to the groundwater.

7. Cover Crops

Crops of close-growing grasses and legumes used for erosion control during the winter and early spring months and for soil improvement, grazing, and hay production. Soil aeration, permeability, organic matter, and tilth are improved, and successive nitrogen demand will be reduced where legumes are grown as cover crops. Erosion, sediment, and absorbed chemical yields should be decreased in conventional tillage systems because of the increased period of vegetal cover. Plants will take up available nitrogen and prevent its undesired movement. Organic nutrients may be added to the nutrient budget reducing the need to supply more soluble forms. Overall volume of chemical application may decrease because the vegetation will supply nutrients.

8. Critical Area Planting means planting on critically eroding agricultural areas in order to reduce erosion. Establishment of permanent vegetation or temporary covers of close-growing plants that have quick growth characteristics for short-term, seasoned soil protection on critically eroding areas. This BMP requires greater amounts of fertilizer and lime,

higher seeding rates, and more seedbed preparation than normal vegetation operations and is often used in combination with structural practices such as grade stabilization structures. This practice is excellent for erosion control. However, fertility and soil moisture are normally low in critically eroding areas, and intensive maintenance is often required after vegetation is established. Examples of applicable critically eroding areas include drainageways, access roads, denuded areas in the Piedmont and Upper Coastal Plain, streambanks, farm and logging roads, construction sites, and abandoned mine sites.

9. Cropland Conversion means the establishment of perennial grasses, trees, or permanent wildlife plantings on excessively eroding cropland.

10. Diversion

A channel with a supporting ridge on the lower side constructed across the slope to divert excess water from cropland areas. This practice allows interception and disposal of runoff at a selected location. Diversions serve to reduce the length of slopes and to channel surface runoff to suitable outlet locations. A primary purpose of this BMP is protection of land below the structure. In certain cases the practice is effective in diverting animal waste runoff from streams and may be used in combination with sod to filter out nutrients and fecal bacteria. Diversions reduce soil erosion on cropland and critically eroding areas of all land uses. This practice will assist in the stabilization of a watershed, resulting in the reduction of sheet and rill erosion by reducing the length of slope. Sediment may be reduced by the elimination of ephemeral and large gullies. This may reduce the amount of sediment and related pollutants delivered to the surface waters. This practice diverts surface runoff away from particular areas and prevents the incorporation of any pollutant within

these areas into the runoff and the transport of these pollutants to the receiving waters.

11. Field Border

A strip of vegetation established on field borders or edges to control erosion. This is a relatively inexpensive method of filtering sediment, nutrients, and fecal bacteria from runoff and is often used in combination with other practices such as terraces and grassed waterways. Research indicates that strips of vegetation around field borders can remove the majority of sediment and nutrients in surface runoff.

12. Filter Strip

A strip or area of perennial vegetation for removing sediment, organic matter, and other pollutants from cropland or as part of waste management systems for treating runoff from concentrated animal areas. Filter strips for sediment and related pollutants meeting minimum requirements may trap the coarser grained sediment. They may not filter out soluble or suspended fine-grained materials. When a storm causes runoff in excess of the design runoff, the filter may be flooded and could cause large loads of pollutants to be released to the surface water. This type of filter is effective as long as the flow through the filter is shallow sheet flow. Filter strips for runoff from concentrated livestock areas may trap organic materials, solids, materials which become absorbed to the vegetation or the solids within the filter. Often they will not filter out soluble materials. This type of filter is often wet and is difficult to maintain. Filter strips for controlled overland flow treatment of liquid wastes may effectively filter out pollutants. The filter must be properly managed and maintained, including the proper resting time. This may improve the quality of surface water and has little effect on soluble material in runoff or on the quality of groundwater.

13. Grade Stabilization Structure means a structure to stabilize the grade of agricultural cropland or pasture land where concentrated and high velocity runoff occurs. Structures designed to stabilize erosion occurring in natural and artificial channels where erosion occurs due to significant elevation differences are designed to either reduce any sharp change in elevation or grade or to provide a stable area where the change in elevation takes place. These structures substantially reduce erosion and off-site sediment damage associated with channel and gully erosion.

14. Grassed Waterway means a natural waterway or outlet shaped or graded and established in suitable vegetation which is used to route excess water from cropland. Natural or constructed open drains, shaped and vegetated with close-growing sod and designed to prevent erosion in drainageways where runoff water concentrates. This practice is most often used in row crop fields to provide a runoff outlet for terraces or diversions. This BMP is effective in reducing channel or gully erosion and serves the same filtering function as a filter strip.

15. Grasses and Legumes in Rotation

Rotating field crops with sequences of grasses and legumes. This is an excellent non-structural method for reducing erosion and related sediment and nutrients. Total soil loss is greatly reduced for the rotation cycle as compared to continuously tilled field crops. However, soil loss is unequally distributed over the rotation cycle. Reduced runoff and increased vegetation may lower erosion rates and subsequent yields of sediment and sediment-attached substances. Less applied nitrogen may be required to grow crops because grasses and legumes will supply organic nitrogen. During the period of the rotation when the grasses and legumes are growing, they will take up more phosphorus. Less pesticides may similarly be required with this practice.

16. Heavy Use Area Protection

Stabilizing high concentration areas for livestock to reduce stream loading of sediment and/or animal waste. Protection may result in a general improvement of surface water quality through the reduction of erosion and the resulting sedimentation. Some increase in erosion may occur during and immediately after construction until the disturbed areas are fully stabilized. Some increase in chemicals in surface water may occur due to the introduction of fertilizers for vegetated areas and oils and chemicals associated with paved areas. Fertilizers and pesticides used during operation and maintenance may be a source of water pollution. Paved areas installed for livestock use will increase organic, bacteria, and nutrient loading to surface waters. Changes in groundwater quality will be minor. Nitrate nitrogen applied as fertilizer in excess of vegetation needs may move with infiltrating waters. The extent of the problem, if any, may depend on the actual amount of water percolation below the rootzone.

17. Livestock Exclusion or Fencing

Permanent fencing used to exclude livestock from an area and is to be used in conjunction with livestock waste treatment systems, stream crossings, streambank protection or other areas as needed to protect surface water quality. Livestock exclusion may improve water quality by preventing livestock from being in the water or walking down the banks, and by preventing manure deposition in the stream. The amount of sediment and manure may be reduced in the surface water. This practice prevents compaction of the soil by livestock and prevents losses of vegetation and undergrowth. This may maintain or increase evapotranspiration. Increased permeability may reduce erosion and lower sediment and substance transportation to the surface waters. Shading along streams and channels

resulting from the application of this practice may reduce surface water temperature.

18. Mulching

Application of a biodegradable material, such as hay, straw, animal manure, poultry litter, or wood shavings to erosive areas that have been newly planted with grasses or legumes. Mulching helps ensure an adequate stand of vegetation by retaining soil moisture, retarding weed growth, controlling soil temperature, and reducing erosion and is especially applicable on critically eroding areas. Primarily used as a component practice of Critical Area Planting. This practice may reduce the delivery of sediment and related chemicals to surface water by reducing runoff and erosion. The temperature of the surface runoff may be lowered.

19. Nutrient Management or Control

This involves such practices as setting realistic crop yield goals, fertilization rates, application, and timing. By applying this system, nutrients in surface water and groundwater are reduced.

20. Pastureland and Hayland Planting

Long-term stands of perennial, biennial, or reseeding forage grasses and legumes are established to provide livestock food, protect soil from erosion, and reduce runoff. The long-term effect will be an increase in the quality of the surface water due to reduced erosion and sediment delivery. Increased infiltration and subsequent percolation may cause more soluble substances to be carried to groundwater.

21. Pastureland Conversion means establishing trees or perennial wildlife plantings on excessively eroding pastureland that is too steep to mow or maintain with conventional equipment.

22. Pesticide Management or Control

This involves using alternative pesticides and applying pesticides in the

correct formulation, amount, placement, timing, and frequency. It also involves using resistant crop varieties, optimizing crop planting time, plant pest quarantines, and integrated pest management. Through the use of these practices, pesticides in surface and groundwater are reduced.

23. Planned Grazing Systems means the management of grassland or grass-legume pastures to provide sustained production of livestock while minimizing soil erosion. Two or more grazing units are alternately rested and grazed to maintain and improve existing cover; to reduce erosion and improve water quality; to increase efficiency of grazing to ensure a supply of forage throughout the grazing season; to increase quantity and quality of forage; and to enhance wildlife habitat.

    Planned grazing systems normally reduce the time livestock spend in each pasture. This increases quality and quantity of vegetation. As vegetation quality increases, fiber content in manure decreases which speeds manure decomposition and reduces pollution potential. Compacted layers of the soil tend to diminish because of the opportunity for freeze-thaw, shrink-swell, and other natural soil mechanisms to occur that reduce compacted layers during the absence of the grazing animals. This increased infiltration, increases vegetation growth, slows runoff, and improves the nutrient and moisture filtering and trapping ability of the area. Decreased runoff will reduce the rate of erosion and movement of sediment and dissolved and sediment-attached substances to downstream water courses. No increase in groundwater pollution hazard would be anticipated from the practice.

24. Reservoir Tillage means creating small dams or dikes between rows of a crop to retain water.

25. Rock-lined Waterways or Outlets means a waterway or outlet having an erosion-resistant lining or permanent material used to provide for safe disposal of runoff.

26. Row Arrangement

Arranging row patterns to provide drainage toward a desired outlet. The practice is effective on flatter slopes for draining runoff water through a grassed filter strip or grassed waterway prior to entering a stream. This BMP can often provide a more efficient pattern for farming operations. When this practice is part of a drainage system, the accelerated runoff may have the potential or carrying more dissolved pollutants into the receiving waters. There may be a small increase in the amount of sediment removed from the field. Other applications of this practice may reduce runoff, reduce erosion, and increase infiltration. There may be less pollutants transported to the surface waters, and the possibility of pollutants entering the groundwater may be increased.

27. Sediment Control Structure means a temporary or permanent basin constructed to collect and store sediment. Construction of dams across drainage courses to help filter out sediment, related nutrients, and other pollutants. The velocity of runoff water is reduced, permitting much of the sediment and nutrients to settle onto the basin bottom while runoff is temporarily detained.

28. Sod-based Rotation means establishing perennial grasses and/or legumes or a mixture of them on excessively eroding cropland and maintaining at least a four-year rotation.

29. Spring Development means improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities.

30. Stock Trails and Walkways

A system used to control erosion where livestock cross ditches, streams, or

other areas where surface water quality needs to be protected. Must be used in conjunction with livestock exclusion. Water quality impacts from this practice, under range conditions, are negligible, although improving grazing distribution on any area usually improves water quality. Increased bedding on the walkways will increase manure concentrations, but nutrient content of manure will only reflect nutrient content of the vegetation unless supplemental feed is being fed to grazing animals.

31. Stripcropping means growing crops in a systematic arrangement of strips or bands across the general slope. The crops are arranged so that a strip of grass or close-growing crop is alternated with a clean-tilled crop or a crop under a conservation tillage system. Soil loss is reduced by about 25 to 50 percent over the same cropping system utilizing contouring alone. The alternation of grass or close-growing crops also act as filter strips, removing sediment, nutrients, and pesticides. The site must be suitable to establishment with grasses, legumes, and/or close-growing annuals. One disadvantage is that typically half the field is removed from row crop production.

32. Terraces

Earth embankments or ridges with a channel constructed across the land slope at suitable spacing and an acceptable grade to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet. These structures function much the same as diversions, except that terraces are usually constructed closer together, support less total watershed, are smaller than diversions, and are not vegetated. This measure is one of the most widely used structural erosion control practices on cropland. Fields where terraces are applied, can usually be maintained in productive condition and maximum yields can be sustained. This practice reduces the slope length and the amount of surface runoff which passes over the area

downslope from an individual terrace. This may reduce the erosion rate and production of sediment within the terrace interval. Terraces trap sediment and reduce the sediment and associated pollutant content in the runoff water which enhances surface water quality. Terraces may intercept and conduct surface runoff at a non-erosive velocity to stable outlets, thus reducing the occurrence of ephemeral and classic gullies and the resulting sediment. Increases in infiltration can cause a greater amount of soluble nutrients and pesticides to be leached into the soil. Underground outlets may collect highly soluble nutrient and pesticide leachates and convey them directly to surface waters. By collecting surface runoff and conveying it directly to an outlet, terraces may increase the delivery of pollutants to surface waters. Terraces may have detrimental effect on water quality if they concentrate and accelerate delivery of dissolved or suspended nutrients or pesticide pollutants to surface or groundwaters.

33. Trough or Tank

A device constructed for livestock watering in conjunction with livestock exclusion from streams. By excluding livestock from waterbodies, erosion and bacteria runoff are reduced.

34. Waste Management System means a planned system for managing liquid and solid waste runoff from concentrated animal areas.

35. Waste Storage Pond or Structure

A structure in which animal waste or other agricultural waste is safely stored until proper disposal. This may be a concrete tank or an earthen pit, dam, or embankment. Earthen structures are lined with an impermeable clay liner to prevent groundwater contamination. The waste material must be periodically removed, usually to be applied to the land. Proper disposal equipment should be a part of the complete system.

36. Waste Treatment Lagoon

An impoundment made by excavation or earthfill for biological treatment of animal or other agricultural waste. The lagoons are lined with a clay liner to prevent groundwater contamination. Lagoons receive animal waste directly from the source of concentrated livestock or poultry. The waste is treated biologically by bacteria existing within the lagoon. Lagoons may need occasional waste removal as with a waste holding pond or tank. Animal waste treatment lagoons do not provide sufficient treatment to allow discharges of wastewater. This practice may reduce polluted surficial runoff and the loading of organics, pathogens, and nutrients into the surface waters. It decreases the nitrogen content of the surface runoff from feedlots by denitrification. Runoff is retained long enough that the solids and insoluble phosphorus settle and form a sludge in the bottom of the lagoon. There may be some seepage through the sidewalls and the bottom of the lagoon. Usually the long-term seepage rate is low enough so that the concentration of substances transported into the groundwater does not reach an unacceptable level.

37. Waste Utilization or Land Application of Waste

Application of animal or other agricultural waste to agricultural land. The waste is disposed of while improving plant resources through increased fertility. This practice increases soil tilth, lowers erosion hazard, and is most effective for reducing pollution potential of animal waste nutrients and fecal bacteria when the waste is incorporated into the soil. Application rates are based on plant nutrient (usually nitrogen) requirements. Waste utilization helps reduce the transport of sediment and related pollutants to the surface water. Proper site selection, timing of application, and rate of application may reduce the potential for degradation of surface and groundwater. This practice may increase

microbial action in the surface layers of the soil, causing a reaction which assists in controlling pesticides and other pollutants by keeping them in place in the field. There could be potential groundwater impacts associated with this practice.

38. Water Control Structure means a manmade structure installed in on-farm water management systems to reduce the delivery of nonpoint source pollutants into main water courses.

Four Year Action Plan

Table 5 is a summary of cooperating agencies and activities identified to meet goals established for the category of agricultural nonpoint source within the sections identified by the cooperating agencies. These activities are scheduled over the next four years and are designed to reduce contributions of nonpoint source pollutants to waterbodies from agricultural operations. The activities listed are the major functions; however, subsets of these functions that will be done on a day to day basis are not shown in Table 5.

These activities will be continuously reviewed by the cooperating agencies and will be modified to meet changing demands.

AGENCY ABBREVIATIONS SHOWN ON FOLLOWING CHART

1. USDA - United States Department of Agriculture
2. EPA - Environmental Protection Agency
3. USDA-SCS - Soil Conservation Service
4. USDA-ASCS - Agricultural Stabilization Service
5. USDA-ARS - Agricultural Research Service
6. USGS - United States Geological Survey
7. SWCD - Soil and Water Conservation Districts
8. WCD - Watershed Conservation Districts
9. CU - Clemson University
10. SCLRCC - South Carolina Land Resources Conservation Commission
11. SCDHEC - South Carolina Department of Health and Environmental Control
12. SCDWMRD - South Carolina Department of Wildlife and Marine Resources
13. SCFC - South Carolina Forestry Commission
14. CES - Cooperative Extension Service

Table 5

NPS CATEGORY: AGRICULTURE

Programs and Cooperating Agencies

Subcategory	Monitoring	Research	Education: Information	Education: Demonstration	Assistance: Technical	Assistance: Financial	Regulations	Compliance
Sediment	EPA	ARS	CES	SCLRCC	SCLRCC	ASCS	SCLRCC (State Lands)	SCS
	USGS	CU	SCLRCC	CES	SCS	EPA	DHEC	ASCS
	DHEC		SCS	SCS	CES	SCLRCC		
	CU		ASCS	ASCS	SCFS	SCS		
			SWCD		SCWMRD			
			SCFC					
			SCWMRD			EPA		
Nutrients			DHEC		SCLRCC	SCS		
					SCS	ASCS		
					CES	SCLRCC		
Pesticides					CES	ASCS	CU	
					SCS	SCS	DHEC	
						EPA	EPA	
						SCLRCC		
Animal Wastes				CES				
				SCS				
				ASCS	SCS	ASCS		
				DHEC	CES	SCS	DHEC	
					DHEC	EPA		
Groundwater				CES				
				SCLRCC				
				SCS	SCLRCC			
				SWCD	CES		DHEC	
				ASCS	SCS			
				DHEC	DHEC			

FOUR YEAR ACTION PLAN

Section: Monitoring and Research
Goal: 1. Develop BMP systems that will minimize water quality impacts of NPS pollution.
2. Develop expanded water quality program

Cooperating Agencies: CU, SCLRCC, SCS, ARS, DHEC

Activities	Calendar Year 1989	1990	1991	1992
Goal 1				
a. Evaluate existing BMPs by monitoring or modeling in conjunction with specific land use	X	X	X	
b. Compile list of applications for existing BMPs to minimize NPS pollution	X	X		
c. Develop and evaluate new technology applications for minimization of NPS pollution	X	X	X	X
d. Compile water quality data bases for use with GIS	X	X	X	X
e. Develop and use models to evaluate BMP effectiveness of application for conditions prevalent in the Piedmont and Coastal Plains of South Carolina	X	X	X	X
f. Calibrate models where data bases exist		X	X	
g. Study the effect of BMPs especially conservation tillage on groundwater quality	X	X	X	
h. Quantify the efficiency in uptake of nutrients for crop varieties	X	X	X	X
i. Conduct research in integrated pest management (IPM) programs for high pesticide use areas (e.g., cotton, tobacco, vegetables, orchards)	X	X		

j.	Improve methods of handling the volume of animal wastes produced and applied through land application systems to prevent over-application and identify sites that are not appropriate	X	X	X	X
k.	Integrate disposal of animal wastes into animal housing designs so that it is contained in a manner which will allow full utilization of the nutrients in appropriate land application systems	X	X	X	
l.	Characterize chemical decomposition as a function of soil, crop, and climatic conditions using field, laboratory, and modeling techniques	X	X	X	X
m.	Continue to research groundwater impacts of animal waste lagoons	X	X	X	X
n.	Develop proposal for research funding concerning selected BMPs	X	X		
o.	Update technical guides to include the latest research and information concerning NPS water quality, water quality improvements, protection techniques, and BMPs		X	X	
p.	Develop additional standards that may be necessary to measure NPS impacts and the effects of BMPs, including, but not limited to a sediment standard and an erosion control standard that reflects a level of control that would allow sediment standards to be set	X	X	X	X
q.	Analyze the costs of various BMPs		X	X	
Goal 2					
a.	Show the potential benefits to water quality of an expanded research program	X	X	X	X
b.	Coordinate water quality programs between agencies to avoid duplication of effort and to improve overall cost effectiveness	X	X	X	X

c.	Seek additional funding for expanding water quality data collection on a Statewide basis	X	X	X	X
d.	Develop data to show social and economic benefits of improved water quality	X	X	X	X
e.	Seek funding to include water quality monitoring data into GIS for expanded use	X	X	X	X
f.	Seek funding to compile data that can be used to expand awareness of water quality concerns	X	X	X	X
g.	Coordinate NPS activity related to water quality	X	X	X	X

Section: Education/Information/Demonstration
Goal: Promote voluntary use of BMPs statewide and in targeted watersheds.

Cooperating Agencies: CU, SCLRCC, SCS, ASCS, SC Forestry Commission

	Activities				
a.	Use newsletters, radio programs, other media to inform landowners, others of NPS program, program goals, BMPs that can be used to solve water quality problems	X	X	X	X
b.	Incorporate NPS information into program announcements for ACP, FIP, LTWs, and FSA	X	X	X	X
c.	Develop and conduct demonstration of BMPs including new BMPs and innovative application of existing BMPs	X	X	X	X
d.	Show cost benefits of BMPs		X	X	
e.	Hold water quality meetings and include water quality topics in all applicable conferences/ conventions	X	X	X	X
f.	Include water issues and BMP information in agency information programs Statewide	X	X	X	X

g.	Integrate existing approaches into systems which enhance water quality	X	X	X	X
h.	Involve appropriate State agencies for field days and demonstration of BMPs	X	X	X	X
i.	Use rainfall simulation to demonstrate effectiveness of BMPs during demonstrations	X	X	X	X
j.	Educate the general public as to ways that land users can reduce NPS pollution	X	X	X	X
k.	Expand educational programs in State universities, colleges, and technical colleges related to BMPs	X	X	X	X
l.	Provide information in Extension newsletters via CUFAN computer network concerning demonstrations and the profitability of environmentally favorable practices with standard practices used by growers	X	X	X	X
m.	Consider the NPS impacts of pesticide and fertilizer recommendations, particularly as related to high application areas such as orchard crops	X	X	X	X
n.	Develop practical information and guidelines that will be useful to land owners/users in evaluating the economic and other effects of NPS pollution on their operations, evaluating the effects of applying BMPs, and making comparisons of different systems of practices	X	X	X	X
o.	Demonstrate IMP (Integrated Pest Management) Programs	X	X	X	X
p.	Publish results in brochures and other forms that will be available to the public	X	X	X	X

Section: Technical and Financial Assistance
Goal: 1. Provide statewide effort technical and financial assistance for improved water quality.
2. Direct technical and financial assistance to targeted priority watersheds/water bodies for implementation of BMPs.

Cooperating Agencies: CU, SCLRCC, SCS, ASCS, DHEC, SC Forestry Commission

Activities				
Goal 1				
a. Expand water quality as a major emphasis of cost-share programs		X	X	X
b. Encourage water quality BMPs through ACP, FIP, and FSA programs	X	X	X	X
c. Continue to provide tax credits for BMPs	X	X	X	X
d. Evaluate need for a state cost-share program for agriculture		X	X	
e. Continue to provide technical assistance for good water quality practices through Soil and Water Conservation Districts	X	X	X	X
f. Use existing State and federal cost-share and other incentive programs	X	X	X	X
g. Refine existing programs where necessary in order to meet NPS objectives	X	X	X	X
h. Provide conservation equipment for use by landowners/users	X	X	X	X
i. Evaluate the need for, and develop additional State and local incentives as deemed appropriate	X	X	X	X
Goal 2				
a. Seek funding for assistance and for evaluation of BMPs and track their effectiveness	X	X	X	X
b. Concentrate tax credits, funding, and education to prioritized watersheds	X	X	X	X

c.	Provide technical assistance pursuant to the Small Watershed Program (PL-566), special water quality projects, or other programs for landusers in watersheds for which programs and projects are planned and funds are available	X	X	X	X
d.	Cost share with landowners in water quality projects	X	X	X	X
e.	Seek input from all agencies in developing special water quality projects	X	X	X	X

Section: Regulation and Compliance
Goal: 1. Implement and enforce existing regulations and programs.
2. Identify the need for additional regulatory and compliance programs.

Cooperating Agencies: CU, SCLRCC, SCS, ASCS, DHEC

	Activities				
Goal 1					
a.	Develop procedures for collection and disposal of pesticide containers, pesticide residue, and waste pesticide	X	X		
b.	Implement procedures for collection and disposal of pesticide containers, pesticide residue and waste pesticide		X	X	
c.	Encourage landowner participation in Food Security Act programs such as CRP, Acreage Reduction Program	X	X	X	X
d.	Emphasize compliance with Swampbuster and Sodbuster provisions of FSA, Conservation Compliance	X	X	X	X
e.	Deny program benefits for noncompliance with Sodbuster, Swampbuster	X	X	X	X
f.	Spot check cost-shared BMPs for maintenance	X	X	X	X
g.	Spot check for compliance with Swampbuster, Sodbuster	X	X	X	X

h.	Assist landowners with staying in compliance with the 1985 farm bill provisions, discuss water quality issues with landowners in the planning process	X	X	X	X
i.	Assist in conservation planning	X	X	X	X
j.	Assist in conservation applications	X	X	X	X
k.	Assist with technical aspects of the animal waste management permitting program	X	X	X	X
l.	Enforce regulations for storm-water management and erosion and sediment control for State owned agricultural land	X	X	X	X
m.	Implement fully the Chemigation Act requiring anti-backflow devices on all irrigation equipment used to apply pesticide or other chemicals	X	X	X	X
n.	Continue to educate pesticide users and enforce the provisions of the S.C. Pesticide Control Act, especially relative to misuse and pesticide druft off-target	X	X	X	X
Goal 2					
a.	Develop a State management program for the protection of groundwater from contamination with agri-chemicals		X	X	
b.	Assist in implementation of BMPs for surface and groundwater protection	X	X	X	X
c.	If voluntary programs do not suceed in improving water quality, evaluate the need for a regulatory program for agricultural nonpoint source pollution		X	X	

Section: Program Management
Goal: 1. Maximize overall program effectiveness
2. Sustain the program after a four year period

Cooperating Agencies: CU, SCLRCC, SCS, ASCS

	Activities				
Goal 1					
a.	Coordinate all NPS activity between all federal, State, regional, and local agencies involved	X	X	X	X
b.	Develop complementary programs rather than overlapping or conflicting efforts	X	X	X	X
c.	Establish joint ventures and cooperative agreements	X	X	X	X
d.	Continue to identify priority watersheds and needs based on new data	X	X	X	X
e.	Conduct periodic evaluation of all activities	X	X	X	X
f.	Obtain attitudes and opinions of general citizenry	X	X	X	X
g.	Seek professional expertise (technical, managerial, etc.) of private sector resources	X	X	X	X
h.	Seek professional and financial support from industry, organizations and foundations	X	X	X	X
i.	Establish joint public-private ventures	X	X	X	X
j.	Use groups such as State Advisory Council on Erosion Reduction and the 46 Local Advisory Councils on Erosion and Sediment Reduction as the focal points to facilitate needed interagency and public-private cooperation	X	X	X	X
Goal 2					
a.	Continue to coordinate and develop programs between agencies	X	X	X	X

b.	Encourage the use of long-term BMPs	X	X	X	X
c.	Seek local, State, and federal funding sources that can be integrated for a cost effective program.	X	X	X	X
d.	After identification of needs that cannot be met with currently available resources, seek the active participation of all appropriate parties in the development of new programs	X	X	X	X
e.	Refine and tailor appropriate existing programs and resources of all existing agencies and organizations in order to meet NPS pollution control needs	X	X	X	X
f.	Seek to have water quality incorporated as a long-term integral part of all applicable programs by the end of the four-year term	X	X	X	X
g.	Evaluate results of the four-year program to assist in determining the need for additional program regulations				X

VII. FORESTRY NPS MANAGEMENT PLAN

Introduction

Forests comprise a major portion of South Carolina's land base. Sixty-three percent, or over 12 million acres, of the State's 19,320,552 acres is in timberland. South Carolina Forestry Commission statistics indicate that 90 percent of the forests in the state are owned by private landowners and 2.2 million acres or about 18 percent are categorized as wetlands. Forested wetlands provide for timber, wildlife, recreation, and water.

Silvicultural practices associated with the road access, harvest and regeneration of timber presents a potential for NPS pollution of the state's waters. In South Carolina's NPS Assessment Report, silviculture contributed only 4 percent to our identified problems, but silviculture is still a concern because forest land represents a large portion of the State's land base and impacts can be significant if BMPs are not used.

NPS Pollution Problems Associated with Forestry Practices

The major groups of pollutants associated with silvicultural activities that potentially affect the state's waters are sediment, nutrients, organics, elevated temperature, and pesticides. Erosion and subsequent sedimentation is the most significant and widespread nonpoint source problem associated with forestry practices. Degradation of water quality as a result of silvicultural activities generally occurs through a combination of man's activities and natural forces.

1. Sediment - Sediment from silvicultural activities originates primarily from roads and skid trails. Removal of timber and the disruption of understory vegetation by movement of logging equipment exposes soils

to the effects of rainfall events. The subsequent erosion that occurs on these disturbed sites depends primarily on soil type and slope. The amount of exposed soil, length of exposure, proximity to waterbodies, amount of precipitation, and mitigation measures (BMPs) also play an important role in erosion and subsequent sedimentation caused by silvicultural activities.

2. Nutrients - Nutrients such as nitrogen and phosphorus in fertilizers are sometimes used to stimulate tree growth in areas characterized by nutrient poor soils. An increase in the nutrient levels of water draining fertilized timberlands occurs accidentally when fertilizer is applied so that it falls directly into waterbodies. Rainfall events which closely follow the application of fertilizer may also temporarily increase nutrient levels. Where forest fertilization is practiced, fertilizer is normally applied only once in a 30 to 40 year rotation. In South Carolina, forest fertilization is limited primarily to the application of phosphorus at limited sites in the Coastal Plain. The effects of nutrients originating from fertilization of timberlands in South Carolina should be minor.

3. Organics - A potential problem from some areas where timber harvests occur is the introduction of organic debris into nearby waterbodies as a result of logging activities. Rainfall events often cause the addition of organic constituents along with sediment loads. Loggers have also sometimes added to the organic burden of surface waters through the disposal of tops and other debris in streams and watercourses. These activities contribute greatly to the biochemical oxygen demand (BOD) in the receiving streams. Resultant reduction of dissolved oxygen concentrations downstream of BOD inputs is sometimes

significant enough to adversely affect fish and wildlife in addition to decreasing the stream's ability to handle other waste loadings.

4. Elevated Temperature - When overstory and understory vegetation along waterbodies is removed, the reduction of shade causes a rise in the water temperature. The surface area, flow, channel gradient and substrate material all influence the impact of shading. Increases in water temperature caused by removing trees may also directly influence the life cycles of vertebrate and invertebrate fauna. Trout streams are especially sensitive to significant temperature increases. Aquatic plants and phytoplankton are sometimes influenced by increases in water temperature. Small streams are very easily affected, often drastically, by exposure to sunlight although they usually show rapid recovery as a result of understory growth.

5. Pesticides and Herbicides - The presence of pesticides or herbicides in surface waters as a result of silvicultural activities may be due to accidental direct application of chemicals on waterbodies or when the application of chemicals is followed by heavy rainfall. The amount of contamination relates to the method of application and skill of applicator. The use of herbicides is generally associated with site preparation and occurs once in a 30 to 40 year rotation. Insufficient data are available to determine the extent of pesticide contamination of surface waters originating from silvicultural activities in South Carolina. The amounts would likely be many times less than occurs from agriculture and most studies have shown insignificant effects.

NPS Programs for Forestry

Programs to abate or control nonpoint source pollution from forestry activities are primarily the responsibility of the South Carolina Forestry

Commission and the United States Department of Agriculture's Forest Service with other agencies having supplementary programs. The S. C. Forestry Commission is directly involved with forestry practices on State Forests and also provides technical assistance to non-industrial private landowners. The U. S. Forest Service is involved with silvicultural activities only on the National Forests within the State. The United States Department of Agriculture, Soil Conservation Service also provides technical assistance to units of government, landowners, and landusers. The United States Department of Agriculture, Agricultural Stabilization Conservation Service (USDA-ASCS) provides funding for forestry cost-share programs.

The S. C. Forestry Commission applies the practices of the Erosion, Sediment, and Stormwater Management Plan on State Forest lands administered by the Commission and in advice given to other State agencies that own forest land as required by the Erosion and Sediment Reduction Act. This regulatory action applies only to State owned lands. The Forestry Commission does not have regulatory authority over privately owned lands; however, they have been involved in promoting the use of voluntary Best Management Practices (BMPs) since the early 1970's. Forestry Commission staff foresters are assigned to each county of the State to assist landowners with proper management of their forest land.

The S. C. Forestry Commission is the lead agency responsible for planning and developing BMPs. Close cooperation among the Forestry Commission and the S. C. Forestry Association, Clemson University Extension Service, and other interested groups and individuals allows a broad representation of the forestry community to have input into the development of BMPS to be utilized in the State. An important benefit of this cooperative effort is that through various committees, these groups are able to discuss problems, recommend solutions, and attempt to correct BMP violations through peer pressure.

The S. C. Forestry Commission and the S. C. Forestry Association are currently cooperating in an effort to promote more awareness and use of BMPs. Two publications on BMPs in South Carolina which have been recently developed are Voluntary Forest Practice Guidelines for South Carolina published by the S. C. Forestry Association with input from the S. C. Forestry Commission and Best Management Practices for South Carolina's Forest Wetlands published by the S. C. Forestry Commission with input from the S. C. Forestry Association. The S. C. Forestry Commission encourages landowners, industry foresters, consulting foresters, loggers, contractors, and others to follow the BMPs outlined in these publications.

Voluntary Forest Practice Guidelines for South Carolina is not oriented toward water quality protection. While the Guide describes BMPs that prevent sediment runoff, it needs to be revised with an emphasis on protecting water quality. The reader needs to be aware that timber harvesting activities may adversely affect nearby waterbodies and it needs to specify BMPs that prevent this nonpoint source pollution.

Through the cooperation of the S. C. Forestry Commission, the S. C. Forestry Association, and Clemson University Extension Service, training programs using video and slide tapes are being developed to educate landowners and the forestry community on BMPs and to promote the use of BMPs. Separate programs are being prepared for general and specific audiences. The S. C. Forestry Association will soon be initiating a series of training sessions that will utilize these materials to make loggers more aware of BMPs and the importance of their use. These training sessions will begin in the Spring of 1989 and will be held at 13 different sites across the State.

The S. C. Forestry Commission is responsible for providing technical assistance on forestry cost-share programs administered by the USDA-ASCS under the Forestry Incentives Program. Established BMPs are followed in all technical

assistance provided under these programs. Tax incentives programs have not been established.

The U.S. Forest Service (USFS) has regulatory authority over the two National Forests in the State, the Sumter National Forest in the Piedmont and Mountain regions and the Francis Marion National Forest in the Coastal Plain region. Forest Land and Resource Management Plans on South Carolina's National Forests recognize the need to use BMPs as the primary means by which water quality objectives may be met. The voluntary BMPs approved by the S. C. Forestry Commission are incorporated into the Forest Standards and Guidelines in the Forest Plans to address nonpoint source pollution. Standards and Guidelines are also developed to aid in the management of other resources including soil productivity, wildlife, recreation, etc.

Silvicultural activities on the National Forests are given a site specific evaluation for environmental effects of alternatives. Maintenance or improvement of water quality is a major concern that carries through the Forest Plans to activity prescriptions, contract preparation, implementation and analysis of final results. Annual monitoring and training sessions are typically provided by the USFS Soil and Water Staff to ensure quality control in the implementation and effectiveness of these practices. Information on practices and activities is provided through public notification and review. The monitoring, training of personnel, and coordination with others (e.g. Southeastern Forest Experiment Station, Clemson University, and Coweeta Hydrologic Laboratory) are important factors in the success of this program.

The U.S. Forest Service has long been concerned and involved in nonpoint pollution abatement and control on the National Forests in South Carolina. Congress provided direction to the USFS through the Weeks Act which allowed for the purchase and reforestation of unwanted and abused farm and swamplands. Repair of the worst severely eroding land began with the Civilian Conservation

Corps (CCC). Since the mid-1970's, the Soil and Water Improvement Program began expanding the acreage treated each year. Much of the funding for these soil and water improvements is provided through the Knutson-Vandenberg Act. These funds are available only for National Forest use within identified boundaries of timber sales.

In the 1980's, through the Soil and Water Improvement Program, rehabilitation of severely eroding lands in South Carolina has averaged 140 acres per year, and watershed improvements have averaged 500 acres per year. USFS projections indicate that the active rehabilitation of these areas prevents much more erosion than occurs on all the other activities within the National Forests. These efforts at reducing nonpoint source pollution and returning this land to productive conditions were a major factor in the Sumter and Francis Marion National Forests receiving the Stewardship Award for 1988 from the Chief of the USFS.

BMPS FOR PROTECTING WATER QUALITY FROM FORESTRY ACTIVITIES

Forest Access Roads

1. Plan access roads so there is a minimum of site disturbance.
2. Use soil survey information to select stable soil types so that erosion is minimized.
3. Avoid steep, narrow ridges, slide areas, gullies, wetlands, stream channels, and ponds.
4. Minimize the number of stream crossings.
5. Where stream crossings are necessary, enter the stream at right angles to the main channel.
6. Construct roads and bridges during dry periods when the threat of erosion is minimized.
7. Clear stream channels of all debris produced during construction.
8. Construct road beds from the sides of slopes, so that runoff will drain away from the embankment (outslope).
9. Limit use of unpacked or clay-based roads during wet weather to reduce rutting.
10. Use seeding, fertilizing, and mulching as needed when natural cover will not be adequate on banks and filled areas.
11. Provide adequate cross drainage to take water off the road and into areas of adequate land cover.
12. Grade road surfaces and outslope as needed.
13. Inspect and clean all drainage structures periodically.
14. Restrict traffic during periods of excessive ground moisture unless the soils are rocky or gravel is used.
15. Where natural cover is not anticipated, seed abandoned roads to grass and provide drainage dips to prevent excessive water runoff and erosion.

16. When near streams, brush barriers or silt fences may be needed to reduce sedimentation.

Additional BMPs relating to forest access roads in wetlands:

17. Road construction in wetlands should be kept to a minimum. All roads should parallel the general flow of water except when crossing from one drainage to another.
18. Culverts should be properly placed and constructed to minimize soil erosion according to the specifications described in Best Management Practices for South Carolina's Forest Wetlands.

Harvesting

1. Assure that logging practices are conducted to avoid unnecessary damage to the soil and to minimize rutting and soil compaction.
2. Keep landings and skid trails to the minimum number and size.
3. Service equipment away from streams and other bodies of water. Dispose of waste oil and lubricants in a legally designated manner.
4. Keep roads, ditches, and streams free of harvesting debris.
5. Locate landings and skid trials to minimize soil movement into streams.
6. Trees harvested near stream banks should be felled and skidded away from the stream to minimize damage to the channel bank.
7. Minimize soil disturbance directly adjacent to stream banks.
8. Use uphill skidding in rugged terrain to the maximum extent possible to provide for subsequent dispersal of surface water from decks. Water diversions and seeding are a must.
9. Fell trees in line with skidding direction when practical to minimize soil disturbance.

10. Use suitable water diversions such as broad based drainage dips and direct runoff into vegetated areas when soils are exposed on skid roads or trails.

Additional BMPs relating to harvesting in wetlands:

11. Schedule harvests during dry periods to minimize impacts on soil compaction and water quality.
12. Use low ground pressure tires on skidders or use cable systems when feasible.
13. Avoid felling trees into active or well defined intermittent stream courses. Trees felled into perennial streams should be removed (including the top) as soon as practical.
14. When log decks must be located in a wetland area, they should be located on the highest ground or on islands within the area.
15. Streamside management zones (SMZs) or buffer areas should be established adjacent to navigable streams in wetlands according to specifications described in Best Management Practices for South Carolina's Forest Wetlands. A SMZ is an area adjacent to the banks of streams and bodies of open water where extra precaution is necessary in carrying out forest practices in order to protect bank edges and water quality. SMZs may be designated as primary (adjacent to the stream) or secondary (peripheral to the primary SMZ).

Site Preparation

1. Every effort should be made to leave the topsoil in place during site preparation activities.
2. On slopes over 30 percent, do not use mechanical site preparation.
3. Windrow debris along the contour or in gullies or skid roads to stabilize them.

4. Intensive practices such as disking, plowing, bedding, or furrowing should be done only as necessary and on the contour. These practices have significant potential to lower site productivity and water quality from erosion especially when slopes exceed 20 percent.
5. When herbicides are used, consult professional foresters and certified applicators who can assist in prescribing and/or application.

Additional BMPs related to site preparation in wetlands:

6. Aerial application of any pesticides or fertilizers will not be permitted within 80 feet of each side of a navigable stream.
7. Avoid any type of mechanical site preparation in primary SMZs.
8. Avoid site preparation practices that significantly disturb surface soil, such as disking and bedding in secondary SMZs.

Four Year Action Plan

South Carolina Forestry Commission with assistance from S. C. Forestry Association and Clemson University Extension Service	Calendar Year			
	1989	1990	1991	1992
Activity				
A. Encourage the use of the BMPs outlined in in the booklets Voluntary Forest Practice Guidelines for South Carolina and Best Management Practices for South Carolina's Forest Wetlands on private lands and ensure that these BMPs are utilized on State Forests and other State managed land.	X	X	X	X
B. Develop and implement educational presentations (slide, tape and/or video productions) dealing with silvicultural NPS problems and BMPs to solve those problems.	X	X	X	X
C. Evaluate BMPs and revise them as needed, based on results and/or new research findings.	X	X	X	X
D. Develop an updated BMP manual for silvicultural practices in South Carolina.	X	X		

United States Forest Service	Calendar Year			
Activity	1989	1990	1991	1992
A. Continue to incorporate the voluntary BMPs recommended by the S.C. Forestry Commission into the Forest Standards and Guidelines in the Forest Plans to reduce NPS problems on National Forest land in South Carolina.	X	X	X	X
B. Conduct annual monitoring and training sessions to ensure quality control in the implementation and effectiveness of these BMPs.	X	X	X	X
C. Provide appropriate information about BMPs to National Forest users through public notification and review.	X	X	X	X

VIII. CONSTRUCTION NPS MANAGEMENT PLAN

Introduction

Urban and built-up areas are essential to the health, safety, economic, and social well-being of the citizens of South Carolina. Facilities, buildings, streets, bridges, etc. are constructed to be serviceable for decades or centuries. Products and services essential to our survival are dependent on these urban and built-up facilities. To produce the facilities needed, it is essential that construction activities continue at the present level or at an increased pace. To do this, a vigorous, efficient, sophisticated construction industry is essential.

In South Carolina, the construction industry employs approximately 6.3 percent of the non-farm work force. The industry contributes approximately 6.9 percent of the non-farm income in the State. This 91,600 employee, $2,113,000,000 industry has a significant impact on the economy of the State.

Water Quality Problems Related to Construction NPS

This industry also has the potential to impact waterbodies through nonpoint source pollution. Typically, sediment is the major pollutant of construction. However, the large quantities of petro-chemical products in the form of gasoline, diesel fuels, oils, and greases usually found on construction sites are a potential source of pollution. In addition, most construction sites usually require large amounts of fertilizer, lime, and other typically agricultural products which can impact water quality. Construction activity, itself, may expose materials which affect pH and nutrient levels in receiving waters. All of these impacts point out the potential damage resulting from construction activities.

In the Assessment of Nonpoint Source Pollution for the State of South Carolina (DHEC, 1988) 332 waterbodies in the State were determined to be impacted by nonpoint source pollution. Fourteen percent of these waterbodies were impacted by construction activities. A further breakdown of these impacted sites indicates that sixty-four percent of the water bodies were in the Piedmont, nine percent in the Coastal Plain-Piedmont interface; and twenty-seven percent in the Coastal Plain. These percentages are not surprising given the steeper slopes and more readily erodible soils in the Piedmont.

NPS Programs for Construction

The Erosion and Sediment Reduction Act requires that erosion and sediment control and stormwater management plans be prepared for all land-disturbing activities on State owned and managed lands. The State Engineer's Office, S. C. Budget and Control Board, is responsible for approving all plans for work in conjunction with the State's Permanent Improvement Projects Program (PIP). The S. C. Land Resources Commission (LRCC) is responsible for all projects which fall outside of the PIP program and for continuing programs, such as the Clemson University Experiment Stations and the non-federal activities of the S. C. Public Service Authority (Santee Cooper).

The only exceptions to this are the lands and land-disturbing activities under the jurisdiction of the S. C. Department of Highways and Public Transportation (DHPT) and forestry areas under the jurisdiction of the S. C. Forestry Commission. The DHPT has adopted regulations for erosion and sediment reduction and stormwater management on lands and land-disturbing activities under its jurisdiction. Likewise, the S. C. Forestry Commission has developed a plan, based on Best Management Practices (BMPs), for erosion and sediment reduction on State owned lands.

The State Engineer and the Commission have entered into a cooperative agreement for the Commission to provide educational and technical assistance to

the staff of the State Engineer. The educational assistance is in the form of on-the-job training, formal workshops, and handbooks and guides. In the area of technical assistance, the Commission will, upon request, review plans submitted pursuant to the Act; conduct meetings and negotiations with architect-engineering firms; and provide field inspection services during the construction of the project. The USDA Soil Conservation Service can also provide technical assistance to units of government, developers, consultants, and individuals in controlling NPS runoff from construction activities.

LRCC developed a technical manual, Erosion and Sediment Control Practices for Developing Areas, which is currently utilized as the implementing tool for construction BMPs for planning stage through final landscaping and maintenance for construction projects in South Carolina.

The Commission is coordinating an eighteen-month study of the Kinley Creek Watershed in cooperation with the University of South Carolina College of Engineering. The watershed is located in Richland and Lexington Counties in central South Carolina. The area is experiencing rapid urbanization/development and streams and lakes in the watershed are suffering severe sedimentation and flooding problems due to increased runoff as well as diminished water quality. In particular, Lake Quail Valley, a small lake on a tributary to Kinley Creek has been silting in at an accelerated rate.

The purposes for the study are (1) to inventory the watershed and its drainage network to compile a comprehensive database; (2) to instrument the watershed at several locations for rainfall, streamflow, and sediment to obtain local data about watershed hydrologic response, watershed and channel erosion, water quality and pond sedimentation; (3) to model the watershed and its drainage system using a regional applicable computer simulation model; (4) to simulate the effects of land use, drainage network changes, and channel modifications on stormwater runoff and erosion; (5) to critically evaluate the

impact of erosion and sedimentation on the instream ponds; (6) to conduct an analysis of alternative stormwater management schemes to identify feasible combinations which minimize the impacts of stormwater runoff and erosion and which can be implemented for existing and future development conditions; (7) to recommend strategies and/or policy changes to remediate existing problems and to minimize future occurrences; and (8) using the results from this study, calibrate a computer model that can be used by local governments statewide to test the effect of NPS runoff from development projects on watersheds and indicate the need and placement of BMPs.

* EPA Funded Projects

The U. S. Environmental Protection Agency requires that BMPs be implemented during the construction of waste treatment facilities that receive federal funds. The Department of Health and Environmental Control (DHEC) enforces this provision by requiring that NPS control measures be addressed in construction plans and specifications submitted to DHEC for review and approval.

* Local Programs

Fifteen counties and several municipalities have adopted erosion and sediment control ordinances which regulate construction activities. Sediment control ordinances have been adopted pursuant to the County Sediment Control Program Act passed by the General Assembly in 1971. Other counties and municipalities regulate some construction activities through provisions in subdivision regulations, zoning ordinances, or building permit programs. Even though these ordinances primarily deal with reducing the flow of sediment from the disturbed site, water quality improvements can be achieved under these programs. These local programs have all been adopted voluntarily by the respective jurisdictions. None of the current laws in effect in South Carolina require adoption of these local programs.

Local programs are typically under-staffed and under-funded. There are no standard qualifications for either personnel involved in the review of plans or in inspection and enforcement. However, Conservation Districts are required to approve plans under programs adopted pursuant to the County Sediment Control Program Act.

* Proposed Legislation

A bill to enact a statewide regulatory stormwater management and sediment control program has been introduced in both houses of the General Assembly. The proposed Stormwater Management and Sediment Reduction Act calls for LRCC to develop and implement a statewide program for land-disturbing activities on private land in developing areas in conjunction with Conservation Districts, federal, State, and local government agencies, and other entities as appropriate. This legislation is a companion statute to the Erosion and Sediment Reduction Act which established a regulatory program for State owned and managed land.

The proposed legislation addresses construction and maintenance for land-disturbing activities undertaken for purposes other than agricultural and timber production, mining activities regulated by the S. C. Mining Act, and single family residences.

The proposed legislation authorizes and directs LRCC to require that all land-disturbing activities be conducted in accordance with stormwater management and sediment control plans approved either at the State or local level. These plans must include measures for stormwater management (both quantity and quality) and sediment control during the land-disturbing activity as well as maintenance of stormwater facilities throughout the life of the facility. No land-disturbing activities adjacent to a waterbody or watercourse would be allowed without the use of a buffer zone between the land-disturbing activity and waterbody sufficient to confine visible sediment within 25 percent of the

buffer zone nearer the activity. Other requirements in the proposed legislation include a requirement that angle of graded slopes or fills is no greater than the angle which can be retained by vegetative cover or other adequate erosion control structures or devices; installation of erosion and sediment control devices sufficient to retain the sediment generated on-site; minimizing sediment damage during and after construction; protection or restoration of quality of surface and groundwaters; and protection of beneficial functions of wetlands.

Each local government would have the option of implementing its own program in conjunction with the applicable Conservation District or allowing the LRCC to implement the program in the local jurisdiction in conjunction with the District. Two or more units of local government would be authorized to establish joint programs. All State and locally administered programs would be based on regulations promulgated by LRCC which would include a model ordinance, technical standards, maintenance requirements, and a minimum fee schedule to support the costs of plan review and site inspections.

Programs adopted by local governments would be subject to approval and periodic review by LRCC. The Commission would have the authority to assume enforcement of any program found deficient in administration or enforcement until such time that the local government indicates its willingness and ability to resume implementation.

Land disturbing sites would be inspected periodically to monitor compliance with the stormwater management and sediment control plans for the sites and to determine if any off-site damages have occurred as a result of runoff from the site. Enforcement actions would include written compliance and directive notices to comply, stop-work orders, and civil and criminal prosecution.

BMPs for Protecting Water Quality from Construction Activities

Both structural (requiring construction) and non-structural (regulations, policies, maintenance, etc.) BMPs are applicable in reducing the impacts of pollution from construction activities.

The following list contains the BMPs currently used in South Carolina:

* Road Stabilization

1. Temporary gravel construction entrance/exit - A stone pad located at any point where traffic will be leaving the construction site and entering a street, alley, sidewalk, parking area, or other right-of-way.
2. Construction road stabilization - Temporary stabilization of access roads, subdivision roads, parking areas, and other transportation routes with stone immediately after grading.

* Sediment Barriers

3. Straw bale barrier - A temporary sediment barrier consisting of a row of entrenched and anchored straw or hay bales.
4. Sediment fence - Filter fabric stretched across and attached to supporting posts and entrenched.
5. Brush barrier - Residue materials from clearing and grubbing making a sediment barrier at the perimeter of a disturbed site.
6. Storm drain inlet protection - A sediment filter or an excavated impounding area round a storm drain drop inlet or curb inlet.

* Dikes and Diversions

7. Temporary diversion dike - A temporary ridge of compacted soil constructed immediately above or below cut or fill slopes.
8. Temporary interceptor dike - A ridge of compacted soil or loose rock or gravel constructed across disturbed rights-of-way and similar sloping areas.
9. Perimeter dike - A ridge of compacted soil constructed along the perimeter of the disturbed area.

10.Temporary fill diversion - A channel with a supporting ridge on the lower side cut along the top of an active earth fill.

* Sediment Traps and Basins

11.Temporary sediment trap - A small temporary ponding area formed by constructing an earthen embankment with a stone outlet across a drainage swale.

12.Temporary sediment basin - A temporary basin with a controlled stormwater release structure, formed by constructing an embankment of compacted soil across a drainage way.

* Flumes

13.Temporary slope drain - A flexible tubing or conduit extending from the top to the bottom of a cut or fill slope.

14.Paved gutter - A permanent concrete-lined channel constructed on a slope.

* Waterways and Outlet Protection

15.Riprap - A permanent erosion-restraint ground cover of large, loose angular stone.

16.Check dam - Small temporary dam constructed across a swale or drainage ditch.

17.Temporary gravel outlet structure - An auxiliary structure installed in conjunction with and as a part of a temporary diversion dike, interceptor dike, perimeter dike, or other structure designed to temporarily detain sediment-laden surface runoff.

18.Level spreader - An outlet constructed at zero grade across a slope.

* Stream and Channel Protection

19.Vegetative streambank or channel protection - Stabilizing the banks of live streams or channels with vegetation.

20.Structural streambank or channel protection - Stabilizing the banks of live streams or channels with permanent structural measures.

21.Temporary stream crossing - A temporary structural span installed across a flowing watercourse such as bridges, round pipes, or pipe arches.

* Site Preparation

22.Land grading - Reshaping the ground surface to planned grades as determined by engineering survey and layout.

23.Surface roughening - Providing soil surface with horizontal depressions.

24.Topsoiling - Methods of preserving and using topsoil in final site grading.

* Vegetation Establishment

25.Temporary seeding - Establishment of temporary vegetative cover on disturbed areas by seeding with rapidly growing grasses, legumes, and small grains.

26.Permanent seeding - Establishment of permanent grass with sod on fine-graded disturbed areas.

27.Sodding - Establishment of permanent grass with sod on fine-graded disturbed areas.

28.Sprigging - Establishment or permanent grass with sprigs on fine-graded disturbed areas.

29.Trees, shrubs, vines, and ground covers - Establishment of a vegetative cover of trees, shrubs, vines, or ground cover on disturbed areas.

* Miscellaneous Practices

30.Tree preservation and protection - Protection of desirable trees from mechanical and other injury during land-disturbing and construction activity.

31.Dust control - Reducing surface and air movement of dust during land-disturbing activities.

32.Buffer strips - Undisturbed strips of vegetation around the site, which storm flow is routed through before being discharged.

* Non-structural Practices

1. Regulatory programs (ordinances, etc.)

2. Education

3. Public Awareness
4. Time wise land disturbance and stabilization - A timetable to disturb only one section of a construction site, then stabilize it before disturbing any other areas. This must be coordinated with the construction plan and timetable.
5. Avoid construction in wetlands.

Four Year Action Plan

The following program presents goals and tasks necessary for South Carolina to effectively reduce impacts of construction activities on water quality. It must be noted that accomplishment of these goals and tasks will largely depend on availability of funding from federal, State, and local sources.

Lead agencies and cooperating agencies are listed for each goal. If an agency or agencies will be specifically involved in the accomplishment of a particular task, they will be listed in parentheses by the task.

Agency Abbreviation as shown on the chart are:

BCB - S.C. Budget and Control Board

CD - Soil and Water Conservation Districts

CU - Clemson University

DHEC - S.C. Department of Health and Environmental Control

DHPT - S.C. Department of Highways and Public Transportation

LG - Units of Local Government

LRCC - S.C. Land Resources Commission

SCS - Soil Conservation Service

FC - Forestry Commission

Four Year Plan to Reduce the Impacts of Pollution from Construction Activities

Goal: Protect surface water and groundwater resources from the effects of pollution from construction.

Lead Agencies: BCB, DHEC, LRCC
Cooperating Agencies: SCS, CD, LG, DHPT, FC, CU

		Calendar Year			
		1989	1990	1991	1992
	Tasks:				
1.	Draft statewide regulatory program legislation. (LRCC)	X			
2.	Evaluate current land use, development, and population data to more closely identify areas that are being effected by both short and long-term NPS impacts. (DHEC & LRCC)	X	X	X	X
3.	Select a watershed in the Midlands or Piedmont and one in the Coastal area of the state to serve as models for urban stormwater management and sediment control on a watershed basis. (LRCC)	X	X		
4.	Establish tests/demonstrations of BMPs, with an emphasis on the proper application, design, installation and maintenance of practices. (LRCC)	X	X	X	X
5.	Develop a construction BMP manual with an emphasis on the proper application, design, installation and maintenance of practices. (LRCC)		X		

6.	Conduct workshops on the policy and technical levels. (LRCC)	X	X	X	X
7.	Conduct workshops for contractors on proper installation of BMPs. (LRCC)	X	X	X	X
8.	Develop training programs for plan review staff and inspection and enforcement staff. (LRCC)	X	X		
9.	Develop certification program for inspection personnel. (LRCC)	X			
10.	Review DHPT projects for compliance with regulations. (LRCC & DHPT)	X	X		
11.	Review Forestry Commission lands for compliance with plan. (LRCC & FC)	X	X		
12.	Develop standards to measure NPS impacts and effects of BMPs. (DHEC & LRCC)	X	X	X	
13.	Develop a sediment control standard. (DHEC & LRCC)	X	X	X	
14.	Monitor water quality throughout program. (DHEC)	X	X	X	X
15.	Review BMPs on all wastewater treatment and transportation facility construction plans for needed BMPs to control erosion and/or stormwater runoff (DHEC)		X	X	X
16.	Calibrate a computer model and database that can be made available to local governments. The model could be run on a PC type computer and give the decision maker the capability to quickly and confidently evaluate NPS impacts of construction development on a watershed system. Results of the model would indicate where adverse impacts would occur, thus where controls were needed. (LRCC)	X	X		

IX. URBAN RUNOFF NPS MANAGEMENT PLAN

Introduction

Control of urban runoff has progressed through several distinct phases in South Carolina. In the late 1960's and early 1970's, emphasis of the State was to control sediment to reduce its impact on streams, waterbodies, and the local infrastructure. As the State continued to experience population growth during the 1970's, incidence of urban flooding, both nuisance and major flooding, increased which resulted in local governments adopting stormwater management ordinances limiting post-development rates of runoff to a pre-development level for disturbed areas. Finally, as a result of programs started in the 1970's under Section 208 of the Clean Water Act and further research conducted in the 1980's, South Carolina has come to appreciate the water quality aspects of controlling urban runoff.

South Carolina has a highly concentrated population. Approximately two-thirds of the State's citizens live in fifteen of the State's forty-six counties. These fifteen counties are located in three distinct physiographic provinces. These areas are the Piedmont, Piedmont-Coastal Plain interface, and the Coastal Plain. Each of these areas is impacted to varying degrees by nonpoint source pollution from runoff originating in developing or urban areas.

Population growth and accompanying growth in residential, commercial, and industrial facilities is occurring at a rapid pace in the State, and barring unforeseen economic problems, this growth is forecast to continue well into the future. Today's statistics indicate approximately six percent of the State's land area is contained in urban or developed land use. In addition, approximately fifteen percent of the State's land area is being converted to

urban or developed uses each year. This rate has held fairly constant since 1970. (LRCC-DHEC, 1978)

Water Quality Problems Associated with Urban Stormwater Runoff

Stormwater runoff is an important cause of water pollution in South Carolina. The major identified sources of urban stormwater pollution include: (1) vehicular and industrial emissions and leakages, (2) combined sewer overflows, (3) street and construction litter, (4) nutrients from fertilizers and animals, (5) pesticides, (6) atmospheric fallout, and (7) deciduous leaves.

Sediment is the greatest pollutant by volume in the State and has received the most attention both from the public as well as the regulatory community. However, other pollutants may also be found in urban runoff and their impacts are beginning to be fully understood.

Plant nutrients, such as nitrogen and phosphorus, are often found in urban runoff in sufficient quantities to stimulate algae growth in impoundments or slow moving streams. Urban runoff can also contain bacteria at levels exceeding health limits for primary contact. Runoff also contains high levels of oxygen demanding materials, which can reduce or deplete dissolved oxygen levels in streams or standing waters. Trace metals, pesticides, and other toxic materials are also prevalent in urban runoff. In the Washington, D. C. NURP study, 28 out of 128 toxic chemicals listed by EPA were discovered in samples of urban runoff (DEP, 1983). Bases on these results, it is reasonable to assume developed areas in South Carolina would experience similar identification of pollutants.

In the Assessment of Nonpoint Source Pollution for the State of South Carolina (DHEC, 1988), 332 waterbodies in the State were determined to be impacted by nonpoint source pollution. Forty-three percent of these waterbodies were impacted by urban runoff. A further breakdown of these impacted sites indicates that twenty-eight percent of the waterbodies were in the Piedmont, twelve percent in the Coastal Plain-Piedmont interface, and sixty percent in the

Coastal Plain. These results are not surprising due to reduced assimilative capacity of coastal plain streams and waterbodies and functioning of these waterbodies as collection points for upstream pollutants.

Stormwater Management Utilities

Stormwater management efforts for both quantity and quality control have been traditionally financed through two methods. First, developers, builders, etc. install stormwater management facilities in new developments for the purpose of preventing exacerbation of existing flooding or water quality problems and/or creation of new problems. Second, existing problems are normally corrected through construction or maintenance activities of local public works departments through funding from general fund sources. This puts activities to ameliorate stormwater management problems in direct competition with projects with more widespread political support limiting monies available to correct stormwater deficiencies. This situation is further complicated by shrinking budgets available to local governments.

Several municipalities in the United States have implemented utilities to correct existing problems and to coordinate efforts to reduce future problems. Basically, a stormwater utility involves creation of a taxing authority which assesses all property in a watershed or in several watersheds to provide a stable funding base to solve problems in the area. This assessment is based on either millage or on factors such as impervious area.

Several counties and municipalities in South Carolina have expressed interest in establishing such a program within their jurisdiction. Currently, comprehensive drainage inventories and computer modelling efforts are underway for these local governments.

Establishment of a stormwater management utility is one of the priority items in an urban runoff management plan. Creation of one or more demonstration utilities using a combination of federal, State, and local grants will allow

coordinating agencies the opportunity to fine-tune the concept for various physiographic areas of the State and to provide the technical assistance necessary to implement the program statewide.

Research/Study

LRCC is coordinating an eighteen-month study of the Kinley Creek watershed in cooperation with the University of South Carolina which will evaluate the impact of stormwater runoff on the watershed. Using results generated from this study, a computer model will be calibrated which can be used by local governments statewide to test effects of urban stormwater runoff from new development on watersheds and indicate the need and placement of BMPs. The study is fully described in Chapter VIII.

Urban Runoff Programs

S. C. Coastal Council and S. C. Land Resources Conservation Commission (LRCC) have been designated as coordinating agencies, in conjunction with other federal, State, local agencies and others to develop strategies to reduce impacts of urban runoff pollution control. LRCC will have responsibility in all non-coastal counties and will work jointly with the S.C. Coastal Council to develop strategies in coastal areas.

Existing and proposed programs which can affect nonpoint source water pollution in South Carolina are described in the following discussions.

* Coastal Stormwater Management

Through the S.C. Coastal Zone Management Act of 1977, S. C. Coastal Council was authorized to develop a coastal zone management plan and review all federal and State permit applications to ensure compliance with the plan. The South Carolina Coastal Council Stormwater Management Guidelines are utilized as the Best Management Practice (BMP) guideline for reviewing development proposals requiring permit and certification decisions within the coastal zone. These

guidelines are based upon the authority of the policies and regulations set forth in the South Carolina Coastal Zone Management Program.

These guidelines are organized in two major sections. The first section presents different types of activities a certain project may fall under and corresponding requirements and restrictions pertaining to that particular class of projects. The major criteria identifying types of stormwater requirements necessary are based on location, lot coverage, and land use. At the end of this first section is a chart which gives an overview of activities which require stormwater management and which devices and controls are required for each activity.

The second section presents design standards and requirements for stormwater management systems. This section is divided into two subsections. The first subsection addresses requirements on retention and detention systems with corresponding design criteria. The second subsection outlines different types of best management practices necessary in managing stormwater management systems, sediment and erosion control practices, and maintenance requirements.

In addition, S. C. Coastal Council staff works with local units of government to achieve more comprehensive implementation of these guidelines. "Critical areas" are defined as coastal waters, tidelands, beaches, and beach/dune systems which is the area from the mean high water mark to the setback line as determined in Section 48-39-280 of the 1988 Coastal Zone Management Act. These areas receive the most attention through the direct permitting system while projects in the remainder of the coastal zone are permitted in cooperation with other State and local agencies. Two planning services are also provided by the S. C. Coastal Council. Through the "Special Area Management Plan" (SAMP), local governments can utilize S. C. Coastal Council staff to obtain planning information on existing and proposed development projects. Through this service, governmental entities are supplied

with specific and general planning tools for NPS control in coastal areas. Through the "Shore Front Management Plan", the S. C. Coastal Council provides coastal communities with assistance relating to beach erosion and coastal development.

* NPDES Permits

Before issuing NPDES permits or State construction permits to municipal, private, domestic, or industrial waste treatment plants, Department of Health and Environmental Control staff considers the potential for contamination of stormwater runoff from the plant site. If necessary, DHEC can require best management practices (BMPs) to control runoff. Monitoring of stormwater may also be required. Although large municipalities collect stormwater runoff, it is discharged untreated into nearby streams and rivers.

A separate category of urban stormwater includes runoff collected by storm sewers and usually discharged into streams and other waterbodies without benefit of treatment. The 1987 Water Quality Act required, in Section 402(p), large city storm sewers and all industrial facility storm sewers be permitted under the NPDES system by February 1991. This includes municipalities having separate storm sewer systems serving a population of more than 250,000. Municipalities serving populations between 100,000 and 250,000 must have permits by February 1993. Storm sewer permit provisions include a requirement to "reduce the discharge of pollutants to the maximum extent practicable", including management practices, control techniques, system design and engineering methods, and such other provisions as the Administrator and the State determine appropriate for control of such pollutants.

*South Carolina Erosion and Sediment Reduction Act

The S. C. Erosion and Sediment Reduction Act increases and more specifically defines statewide responsibilities of S. C. Land Resources Conservation Commission and Soil and Water Conservation Districts (SWCDs) in

regard to erosion and sediment control. In addition, statewide stormwater management is added to the responsibilities of LRCC and the Districts.

The Act addresses all land except mines that are regulated by the S. C. Mining Act and beach erosion, which is addressed by the S. C. Coastal Council.

The Act requires the LRCC to implement a statewide erosion and sediment reduction and stormwater management program. This program includes regulations on State owned and managed land; studies and technical assistance to identify and assist in correcting problems; development of technical standards and manuals; educational materials; demonstration of conservation technology; conferences; assistance to local governments in developing programs, ordinances and policies; and construction of flood prevention projects.

As part of implementation of the Act, LRCC developed a best management practices guidebook, Erosion and Sediment Control for Developing Areas, (LRCC, 1985), which has been adopted as a suggested reference by local governments in the State. LRCC staff is also involved in providing technical assistance to local governments, landowners, developers, and the technical community through workshops, seminars, field visits, etc.

Special emphasis is being placed on treatment of stormwater management and sediment control as a single issue. Water quality is stressed as an integral component of stormwater management in addition to runoff volumes and rates.

SWCDs are responsible for providing leadership for implementation of local erosion, sediment and stormwater programs through technical assistance, demonstration, and coordination of efforts among governmental agencies, organizations, and landowners and users.

The Act requires the Governor to appoint a State Advisory Council on Erosion and Sediment Reduction and requires each SWCD to appoint a Local Advisory Council on Erosion and Sediment Reduction. The advisory councils are charged with examining erosion, sediment and stormwater problems; reviewing

existing programs and recommending new approaches where deemed necessary; and assisting in program development and implementation.

Each SWCD must submit an annual report to LRCC and the Commission is required to submit periodic reports to the Governor and General Assembly.

State and quasi-state agencies must use proper erosion and sediment control and stormwater management measures on land they own or manage. Approximately 800,000 acres of land are under jurisdiction of State and quasi-state agencies.

Land-disturbing activities on State land must be conducted in accordance with regulations and programs developed pursuant to the Act. These requirements are administered by S. C. Land Resources Conservation Commission, State Engineer, Division of General Services, S. C. Budget and Control Board, S. C. Department of Highways and Public Transportation; and S. C. Forestry Commission.

Regulations require LRCC to inspect State land to identify erosion, sediment, and stormwater problems. Problems are reported to appropriate agencies, which are responsible for making corrections pursuant to plans approved by the LRCC.

The Commission has a Land Resources Engineering Division to carry out the technical work of the agency's erosion, sediment, and stormwater program. Division staff include registered professional engineers, hydrologists, agricultural engineers, civil engineers, and registered land surveyors. The work of this staff includes detailed watershed analyses on stormwater management and sediment control, technical assistance for the design of sediment control and stormwater management systems, development of technical manuals, inspection of construction plans and projects in conjunction with S.C. Department of Highways and Public Transportation and the State Engineer, and demonstration/testing of conservation technology.

A network of computer hardware and software provides technical support for these tasks. Collaborative efforts established with university engineering departments form a strong base for assisting communities and local governments having a need for state-of-the-practice technology in erosion and sediment control and stormwater management. The USDA Soil Conservation Service also provides technical assistance in the control of urban stormwater runoff to State and local units of government, developers, consultants, and individuals.

S. C. Land Resources Conservation Commission receives State appropriations for construction of community flood prevention projects whose benefits include improved stormwater management and better operation of septic tanks and public sewer systems. Projects are implemented in conjunction with SWCDs, local governments, the USDA Soil Conservation Service, and landowners.

*Local Programs

Eighteen counties and several municipalities have adopted erosion and sediment control and/or storm drainage ordinances. Sediment control ordinances have been adopted pursuant to the County Sediment Control Program Act passed by the General Assembly in 1971. Counties in coastal areas which adopted stormwater management programs have done so to comply with S. C. Coastal Council requirements. However, inland counties have adopted stormwater programs pursuant to powers granted them under home rule, zoning, etc. It must be pointed out that only programs in coastal areas address water quality specifically. Inland programs are more oriented to erosion and sediment control and stormwater quantity control programs. However, water quality improvements can be achieved under these programs. These local programs have all been adopted voluntarily by the respective jurisdictions. None of the current laws in effect in South Carolina require adoption of these local programs.

* Proposed Legislation

A bill to enact a statewide regulatory stormwater management and sediment

control program has been introduced in both Houses of the General Assembly. The proposed Stormwater Management and Sediment Reduction Acts calls for LRCC to develop and implement a statewide program for land-disturbing activities on private land in conjunction with Conservation Districts; federal, State, and local government agencies; and other entities as appropriate. The legislation is a companion statute to the Erosion and Sediment Reduction Act which established a regulatory program for State owned and managed land.

The proposed legislation addresses construction and maintenance for land-disturbing activities undertaken for purposes other than agricultural and timber production, mining activities regulated by the S.C. Mining Act, and single family residences.

The proposed legislation authorizes and directs LRCC to require all land-disturbing activities be conducted in accordance with stormwater management and sediment control plans approved either at the State or local level. These plans must include measures for stormwater management (both quantity and quality) and sediment control during land-disturbing activity as well as maintenance of stormwater facilities throughout the life of the facility. No land-disturbing activities adjacent to a waterbody or watercourse would be allowed without use of a buffer zone between the land-disturbing activity and the water sufficient to confine visible sediment within 25 percent of the buffer zone nearer the land-disturbing activity. This provision would not apply to activities in connection with construction of facilities to be located on, over, or under a waterbody or watercourse. Other requirements in the proposed legislation include ensuring that after development, runoff from the site approximates the rate of flow, volume, and timing of runoff that would have occurred following the same rainfall under, to the extent practicable, pre-development conditions; maintaining natural hydrodynamic characteristics of the watershed as nearly as possible; protecting or restoring quality of surface

and groundwaters; ensuring sediment damage during and after development is minimized; and protecting beneficial function of wetlands. LRCC would have jurisdiction over land-disturbing activities crossing local government jurisdictional boundaries conducted by entities with power of eminent domain.

Each local government would have the option of implementing its own program in conjunction with the applicable Conservation District or allowing LRCC to implement the program in the local jurisdiction in conjunction with the District. Two or more local units of government would be authorized to establish joint programs. All State and locally administered programs would be based on regulations promulgated by LRCC which would include a model ordinance, technical standards, maintenance requirements, and a minimum fee schedule to support costs of plan review and site inspections.

Programs adopted by local governments would be subject to approval and periodic review by LRCC, including programs previously adopted by local governments and in effect at time of passage of the legislation. LRCC would have authority to assume enforcement of any program found deficient in administration or enforcement until such time that local government indicates its willingness and ability to resume implementation.

Land-disturbing sites would be inspected periodically to monitor compliance with stormwater management and sediment control plans for sites and to determine whether off-site damages have occurred as a result of runoff from the site. Enforcement actions would include written compliance notices and directive notices to comply, stop-work orders, and civil and criminal prosecution.

BMPs for Protection of Water Quality from Urban Stormwater Runoff

Both structural (requiring construction) and non-structural (regulations, policies, maintenance, etc.) BMPs are applicable in reducing the impacts of pollution from storm runoff.

The following list contains construction BMPs currently in use in South Carolina. Based on computer simulations and watershed demonstrations, other BMPs may be added to the list and existing BMPs may be modified.

* Transporting Stormwater Off-site

1. Sheet flow - usually requires only grading and seeding during construction.
2. Swales - Grassed low areas graded at a minimum of 4:1 side slopes.
3. Rock-lined ditches - A conventionally constructed ditch with a layer of loose gravel type rock material lining the bottom.

* Collection - Distribution

4. Oil and grease filtering catch basins - Structures designed to collect and distribute runoff coming from parking areas.
5. Raised catch basins - Catch basins constructed so that the top lip of the catch basis is raised 1 to 2 inches above the surrounding swale or surface elevation.
6. Dual compartment catch basins - Similar to other catch basin designs except that they contain multi-compartments.
7. Dry wells-seepage pits - Cavities dug into the ground and filled with gravel or rocks.
8. Retain natural vegetation - As much existing vegetation as possible should be retained on a given site.
9. Buffer strips - Vegetation should be created or retained along the banks or edges of all waterbodies and wetlands.
10. Parking lot planting areas - Areas within a parking lot set aside for planting or shrubbery.
11. Detention Pond - A water impoundment made by constructing a dam or embankment or by excavating a pit to detain stormwater and discharge it at a controlled rate.

12. Retention Pond - A water impoundment made by constructing a dam or embankment or by excavating a pit to retain stormwater and discharge a controlled volume.

13. Revegetation as soon as possible after soil disturbance.

14. Building setback - Buildings and other structures associated with development projects should be set back from marsh or waterfront locations.

15. Discharge structures - Final elevation of a stormwater discharge outlet is at or above the edge of critical areas.

16. Erosion control fabrics, blankets or nets to provide protective covering.

17. Chemical soil binders - Chemicals which bind the surface of the soil together and can be used to hold mulch and seeds in place while preventing erosion.

18. Dikes and berms or level spreaders - Linear ridges of earth used to control runoff.

19. Culvert riser - An upward extending, perforated pipe fitted over the intake area of a culvert.

*Roof Drainage

20. Discharge locations - A system for collecting, controlling, and disposing of runoff water from roofs.

21. Roof storage - Roof areas used to store water for a detention or retention device.

* Paving Material

22. Minimize impervious surfaces - Many surfaces can be made pervious or modified to reduce the impact of flooding during rainy weather (2).

23. Pervious asphalt paving - Pervious asphalt allows water to pass through the surface and is infiltrated into the subsurface soils.

24. Paving blocks - Used to support automobile traffic and still leave enough unpaved area to allow infiltration to occur.

25.Other pavement surfaces (coquina, gravel, oyster shell) - Surfaces suitable for use in lightly traveled areas.

* Construction Practices

26.Silt fences, hay bales, or other approved erosion control measures properly installed around storm sewer inlets and boundaries of disturbed areas.

27.Temporary check dams - Used to slow stream flow and allow sediment to be deposited.

28.Temporary vegetation or straw cover - Use in exposed areas especially susceptible to erosion.

* Discharge Treatment

29.Physical, chemical, biological, or mixed methods of treating storm runoff.

* Non-structural

30.Regulations.

31.Public awareness.

32.Street cleaning.

33.Street flushing.

34.Catch basin flushing.

35.Maintenance of existing structures and systems.

36.Use natural freshwater wetland areas to effect favorable modification of urban pollutant loads.

Four Year Action Plan

The following chart presents goals and tasks necessary for South Carolina to effectively reduce impacts of urban runoff on water quality. It must be noted that accomplishment of these goals and tasks will largely depend on availability of funding from federal, State, and local sources.

Lead agencies and cooperating agencies are listed for each goal. If an agency or agencies will be specifically involved in accomplishment of a particular task, they are listed in parentheses by the task.

Agency Abbreviations on the Chart Are:

CC - S.C. Coastal Council

CD - Soil and Water Conservation Districts

CU - Clemson University

DHEC - S.C. Department of Health and Environmental Control

DHPT - S.C. Department of Highways and Public Transportation

LRCC - S.C. Land Resources Commission

SCS - Soil Conservation Service

Four Year Plan to Reduce the Impacts of Pollution from Urban Runoff

Goal: Protect surface water and groundwater resources from the effects of pollution from urban runoff.

Lead Agencies: CC, DHEC, LRCC
Cooperating Agencies: SCS, CD, WMR, DHPT, CU

		Calendar Year			
		1989	1990	1991	1992
	Tasks:				
1.	Seek federal, state, and local funding for program.	X	X	X	X
2.	Conduct state-wide storm-water and water quality workshops both on the policy and technical levels. (LRCC)	X	X	X	X
3.	Conduct workshops for contractors on the proper installation of BMPs (LRCC)	X	X	X	X
4.	Conduct demonstrations and computer simulations to determine the effects of various BMP strategies under S.C. climate and soil conditions. (LRCC & CU)	X			
5.	Develop BMP manuals which specifically address water quality based on demonstrations and computer simulations in South Carolina. (CC & LRCC)		X		
6.	Collect additional data on urban stormwater runoff and impacts on receiving waters. (CC, DHEC, & LRCC)	X	X	X	X
7.	Utilize data to calibrate water quality parameters in stormwater management models. (DHEC & LRCC)			X	X

8.	Draft a state-wide, regulatory program for stormwater management and sediment control. (LRCC)	X			
9.	Implement NPDES permit requirements for stormwater discharge. (DHEC)			X	X
10.	Implement alternatives for stormwater management (i.e., utilities, impact fees, permit fees, use of revolving loan fund). (CC & LRCC)	X	X	X	X
11.	Assist as many as 18 beachfront communities in developing programs to address urban stormwater runoff problems and to develop local Shore Front Management Plans. (CC)	X	X		
12.	Calibrate a computer model and database which can be made available to local governments. The model could be run on a PC type computer and give the decision maker the capability to quickly and confidently evaluate NPS impacts of construction development on a watershed system. Results of the model would indicate where adverse impacts would occur, thus where controls were needed. (LRCC)	X	X		

X. MINING NPS MANAGEMENT PLAN

Introduction

South Carolina's mineral production consists of non-fuel minerals that provide raw materials for construction products and the beginnings of a precious metal industry. Mineral production data reported to the U.S. Department of the Interior, Bureau of Mines, indicate that the mining industry in South Carolina produced $314.4 million of non-fuel mineral commodities in 1987. This represents an increase of six percent over 1986 production figures and is the fourth consecutive year of increased mineral production.

Portland cement, clays (kaolin and brick), sand and gravel, and crushed stone represented $270 million, or 86 percent of the total mineral value. Nationally, South Carolina ranked twenty-fourth in 1987 in total mineral value and was thirteenth among the 26 eastern states. At the end of fiscal year 1987-1988, there were 483 mining operations in South Carolina affecting nearly 12,000 acres. Presently there are three gold mining operations in South Carolina with active exploration continuing.

Surface Mining NPS Problems

Surface mining has the potential to generate nonpoint source pollution at any and all phases of operation. These phases include mineral exploration, mine development, extraction, transportation, milling and processing, product storage, waste disposal and reclamation. Since each mineral commodity occurs under a differing range of geologic, hydrologic, climatic, and surface conditions, each mine site is characterized by its own particular set of potential surface water and/or groundwater pollutants. Nonpoint source impacts related to mining activities generally include hydrologic modification, erosion

and sedimentation, water quality deterioration, fish and wildlife disturbances, and public nuisances.

* Hydrologic Modification

Activities associated with mining can result in changes in the hydrologic cycle of the local area. Removing vegetation and topsoil can cause an increase in surface runoff and subsequent decreases in infiltration to the groundwater system. Soil erosion also frequently results, and resulting sediment can move to the bottom of slopes, clogging streams and increasing flood damage over the floodplain. Stream diversion, which is sometimes necessary to recover minerals, can have a significant effect on water quality and quantity to downstream locations. Dredging operations may change a stream's characteristics by increasing its ability to carry water and, thus, may cause increased drainage from wetland systems and increased water movement during flooding. Placement of fill or removal of minerals from wetlands can alter the hydrologic function of these resource areas significantly.

Changes to the groundwater system are more subtle and usually of larger extent. Change in water quality of the aquifer due to introduction of foreign materials may not be detected for months or years. Groundwater recharge may be increased or decreased as a result of mining activities. Dewatering activities can result in changes in surrounding land use by dropping pond levels, drying up surrounding wetlands, reducing soil moisture in neighboring farmlands and lowering water levels in nearby wells.

Where groundwater is present in limestone terrain, special problems can develop when water levels are changed. Because limestone is soluble, over long periods the groundwater within the formation dissolves the limestone, leaving voids which fill with water. When water is pumped out of the formation as in the case of a mining operation, the soil above these voids is left without any support and often collapses.

Hydrologic changes associated with mining activities may result in inducement of salt water intrusion or interaquifer flows resulting in fresh water contamination. Hydrologic modification can not only degrade surface water and groundwater quality, but also may produce damaging modifications to habitats of fish, shellfish, and wildlife.

* Erosion and Sedimentation

Erosion and sedimentation are by far the most common adverse effects mining has on the environment. These effects include water quality degradation from excessive sediment and potential for fluctuation in pH, resulting from various soil (overburden) types.

Erosion is a natural geologic process which can be accelerated when vegetation is removed and land is disturbed by mining activities. The major agents of erosion are water, wind, and gravity. Of the three, running water is the most significant. An important factor of the water erosion process is the balance between infiltration and runoff. Increased runoff leads to accelerated erosion.

Areas in and around the active extraction pit are subject to extensive erosive action. Unpaved haul and access roads are vulnerable to erosion as well as areas cleared for preparation of plant sites or other mine site structures. Stockpiles of soil, waste fines, and other materials can be eroded easily due to steep slope angles and the presence of fine-grained materials. Outlets from drainage ditches and dewatering trenches are also subject to erosion due to the concentration and velocity of large water volumes. Erosion of soil either in place or from stockpiles presents a dual problem. Not only is there a potential for sediment problem, but the soil itself is being lost.

Formation of sediment and resulting sedimentation are primary nonpoint source pollutants associated with mining. Sediment can be generated from erosion of any area of a land-based operation or from dredging of waterways.

Dredging stirs bottom sediment and suspends it in water. Onshore processing of dredged material also can contribute sediment to nearby streams or lakes.

Sediment muddies water and is visually unappealing. Sediment can be deposited in stream channels, impede flow, change the stream course, and possibly change flooding characteristics. When a stream enters a lake, reservoir, or other body of water, flow velocity is reduced where suspended solids are deposited. As a result, water holding capacities can be reduced, and navigation can ultimately be disrupted. During floods, sediment can be deposited on farmland and other valuable lowland property.

Sediment can damage fish and aquatic life habitat by blocking gills, covering eggs or spawning areas with silt, and reducing aquatic production. Sediment can reduce dissolved oxygen level and exclude sunlight, and it can reduce microscopic plant growth, thereby reducing food for organisms in the food chain. Suspended sediment could prevent use of water for domestic purposes; increase water treatment costs; and damage pipes, pumps, and other water distribution systems. Sediment could potentially carry other pollutants, such as pesticides and bacteria.

* Water Quality

Nonpoint source water pollution originating from mine sites is generally a result of one of two actions. The first of these actions is direct introduction of mining and processing substances into a waterbody. Pollutants entering the water may include acids, alkalis, oils, mine sewage, organic reagents, sediments, and dissolved and suspended solids. Water pollution may also be caused by interception or diversion of all or part of a water source. This change in the quantity of water may not only limit the amount of water available for human and industrial consumption, but may alter the composition of natural biological communities. In addition, any natural pollutants present in water may tend to be concentrated. Generally, water pollution from mining operations

is more the result of direct introduction than interception or diversion. A majority of these direct sources of pollution come from physical pollution caused by surface water erosion and from chemical pollution caused by direct discharge of mine drainage. In some instances, nonpoint source pollution may result from a combination of these causes.

In the case of peat mining, water quality problems include increases in organic carbon, significant increases in phosphorus and nitrogen loading, fluctuations in pH levels, and increased concentrations of some heavy metals (i.e., mercury, lead, copper). Organic carbon would be deposited into streams as a result of erosion and drainage. This loading would increase carbon concentrations normally found in adjacent surface waters, promote microbial activity, and increase biochemical and chemical oxygen demand. Peat soils are generally low in phosphorus and nitrogen; however, increased discharges will increase concentrations in adjacent waters. The overall effect would be an increase in bacterial and algal productivity in these waters. The normally acidic effluent from peat mining operations tends to lower the pH of the receiving stream. Algal blooms resulting from increased nutrients (phosphorus and nitrogen) in combination with the low pH waters could lead to fluctuations in pH over a 24-hour period. Most peatlands have been found to contain heavy metals such as copper, mercury, lead, and nickel. Any discharge could contribute to background levels found in adjacent streams.

South Carolina ranks second nationally in the production of kaolin. Mine spoils associated with extraction of this mineral vary in concentration of elements and particle size distribution. Soil reaction of spoil materials ranges from approximately pH 1.8 to 8. Major toxicity is associated with low pH and high concentrations of iron and suspended solids. Infiltration capacity and erodibility of spoil material is related to length and steepness of slope, sand-clay ratio, and extent of crusting and compaction in the surface layer.

Though potential exists for water quality degradation from both active and abandoned mines, abandoned kaolin mines pose the greatest threat to water quality since there are generally no controls for erosion and/or off-site drainage.

Acid mine drainage in South Carolina is usually confined to areas where sulfide minerals, particularly pyrite, are found in association with other minerals being mined. These minerals are generally found in the Piedmont of South Carolina, particularly in mineralized zones of the Carolina Slate Belt and the Kings Mountain Belt. Once these sulfide minerals are exposed to the atmosphere, treatment of acid mine drainage for stream protection involves neutralization of acidity and removal of dissolved ions. Nonpoint drainage from abandoned mines has the greatest potential for chemical water pollution.

South Carolina has the only active gold mining operations located in the eastern United States. Nonpoint effluent from both active and inactive gold mining operations may pose a real threat to both surface and groundwater quality. Pre-law sites that involved tailings deposition have the potential to impact surface water quality through sediment load created by mass movement of tailings material downstream and to influence both surface and groundwater quality through oxidation of metallic sulfides.

* Fish and Wildlife Disturbances

Extraction of mineral resources by surface mining and associated environmental disturbances affect fish and wildlife populations by altering habitats. The degree to which wildlife will be affected generally depends on pre-mine planning, size of operation, length of time the operation exists, installation of pollution control measures, and reclamation designed to enhance fish and wildlife.

The majority of mining in South Carolina involves small scale operations (1-150) acres, and the effect on wildlife is usually displacement caused by

pre-mine land clearing, mineral removal, and mine traffic. In most instances, impacts on wildlife are short-term. Mine pollutants such as fugitive dust, stream sedimentation, noise, chemicals, and fuel spills may create an unfavorable environment for wildlife. These pollutants can affect wildlife habitat directly by destroying vegetation, altering water supplies, silting streams, generating noise, and changing water quality. Fish and wildlife habitat may also be destroyed through hydrologic modification. The greatest potential for effects on fish and wildlife from nonpoint sources is from sediment loading of streams and/or direct ingestion or contact with chemical pollutants.

* Public Nuisances

Mining in general can be very irritating to the public, especially near populated areas or near picturesque landscapes. Many of the effects of mining on the surrounding community related to nonpoint source pollution have already been discussed. Hydrologic modification can alter stream characteristics and increase flooding. Dewatering activities can drop pond levels, reduce soil moisture in neighboring farmlands and lower water levels in nearby wells. Sinkholes may develop in limestone terrain as a result of dewatering. Erosion and sedimentation are visually unappealing and may result in property damage. Wildlife habitat can be altered, changing the recreational use of the surrounding areas. Chemical pollutants can cause public health concerns by affecting drinking water and stock ponds.

* Abandoned Mined Lands

The South Carolina Mining Act serves as part of an overall management plan for effective control of water pollution from permitted mining operations. Before mining permits are issued, provisions must be made to ensure there will be no significant or adverse water pollution impacts from nonpoint sources. However, control of NPS pollution from pre-Law or abandoned mines poses a more

difficult problem because of access restrictions, costs, and lack of regulatory controls.

The S. C. Land Resources Conservation Commission conducted an abandoned mined lands inventory in 1979 and identified over 14,000 acres of abandoned lands, of which 6,033 acres had not been reclaimed. Of acres not reclaimed, 3,948.8 acres were identified as having moderate to severe off-site siltation and/or surface conditions that would require major efforts for reclamation. Specific information regarding effects of nonpoint source pollution was not obtained from this study.

Existing Program Description

The South Carolina Mining Act (Title 48, Ch. 19, S. C. Code 1976, as amended) was passed by the S. C. General Assembly in June, 1973, with an effective date of July 1, 1974, and designated primary regulatory responsibility to the South Carolina Land Resources Conservation Commission. Within the Commission, the Division of Mining and Reclamation is responsible for administering and implementing the South Carolina Mining Act and its implementing regulations (Ch. 48, Article 1, S.C. Code 1976, as amended).

The Mining Act provides: "That the usefulness, productivity, and scenic values of all lands and waters involved in mining within the State shall receive the greatest practical degree of protection and restoration," and "That from the effective date of the Act, no mining shall be carried on in the state unless plans for such mining include reasonable provisions for protection of the surrounding environment and for reclamation of the area of land affected by mining." Enforcement of the Act is through approval of reclamation plans, issuance of mining permits, collection of reclamation bonds, regular inspection of mining operations, development of technical standards, and publishing of informational manuals.

* The Permitting Process

The Mining Act serves as part of an overall management plan for nonpoint source pollution from active mines. Section 48-19-50 of the Act states that "any operator desiring to engage in mining shall make a written application to the Department on the forms furnished by the Department. A completed application consists of one copy of the form entitled Application for a Mining Permit; two copies of the form entitled Reclamation Plan; one copy of the form entitled Land Entry Agreement-Owner or one copy of the form entitled Land Entry Agreement-Lessor/Lessee." Supplemental information may be required after the Department reviews the operator's application for permit.

The Application for a Mining Permit requires an operator to address protection of natural resources, including fish and wildlife, publicly owned facilities, stream beds and lakes, and to describe potential sources of nonpoint pollution such as pumping of groundwater, deposition of sediments, landslides, and acid water pollution. The basic objective of the Reclamation Plan is to establish on a continuing basis, a vegetative cover, soil stability, and water and safety conditions appropriate to the area.

Specific items to be addressed include: (1) methods to prevent or eliminate conditions which will be hazardous to animal or fish life in or adjacent to the affected area; (2) method of restoring or establishing stream channels and stream banks to a condition which will minimize erosion and sedimentation; (3) method for control of contaminants and disposal of refuse including tailings; (4) measures to prevent collection and retention of small pools of water which are likely to become noxious, odious or foul; and (5) a time schedule of reclamation activities, particularly those relating to erosion control, which are keyed to the maps required by the regulations.

Once an operator has submitted a completed application to the Department, an extensive review process begins. A notice of intent to mine is advertised

once a week for two consecutive weeks in a local or areawide newspaper with a circulation in the area of the proposed mine. Copies of the application are sent to S.C. Department of Health and Environmental Control (DHEC) to determine requirements for National Pollutant Discharge Elimination System (NPDES) permits as well as possible DHEC wastewater construction permit requirements. If the proposed mine affects any navigable waters or is located in a capacity use area, copies are sent to S. C. Water Resources Commission. If the proposed mine is located in one of the eight coastal counties, S. C. Coastal Council receives a copy of the application for certification. S. C. Coastal Council reviews each project to assess potential impacts on natural resources in the coastal zone, and to ensure that these projects are in compliance with the Coastal Zone Management Act. Additional copies may be sent to S. C. Wildlife and Marine Resources Department, U. S. Fish and Wildlife Service, USDA Soil Conservation Service, and to U. S. Army Corps of Engineers when appropriate.

At least one and perhaps several pre-permit inspections are conducted by the staff person assigned to the area plus the biologist and the reclamation specialist and/or the hydrologist where deemed necessary. The biologist conducts an environmental appraisal to determine the pre-mining conditions and to identify possible environmental impacts of the operation. Potential nonpoint sources of pollution are identified and discussed with the mine operator and appropriate state officials, and the application is modified to reflect any mitigation measures.

Section 6 of the Mining Act gives the Department authority to apply additional terms and conditions to a permit " as may be deemed necessary by the Department to assure that the operation will comply fully with the requirements of the Act." Violations of any such conditions are treated as violations of the Act. Site-specific concerns regarding nonpoint source pollution are often addressed in this manner. Section 89-9(B) of the Rules and Regulations lists

specific terms and conditions that may be incorporated into a permit relating to sediment and erosion control and protection of surface waters from dredging operations and dewatering measures. After the application package has been reviewed, public notice requirements met, and the environmental appraisal performed, the application is either approved, approved with stated modifications, or disapproved. For those applications which require public hearings, the application is taken before the Board of S. C. Land Resources Conservation Commission for final action.

The Act states that the Department shall deny a permit to mine upon finding:

(1) that any requirement of this act or any rule or regulation promulgated hereunder will be violated by the proposed operation;

(2) that the operation will have unduly adverse effects on wildlife or freshwater, estuarine, or marine fisheries;

(3) that the operation will violate standards of air quality, surface water quality, or ground water quality which have been promulgated by the South Carolina Department of Health and Environmental Control;

(4) that the operation will constitute a substantial physical hazard to a neighboring dwelling house, school, church, hospital, commercial or industrial building, public road, or other public property;

(5) that the operation will have a significant adverse effect on the purposes of a publicly owned park, forest or recreation area;

(6) that previous experience with similar operations indicates a substantial possibility that the operation will result in substantial deposits of sediment in stream beds or lakes, landslides, or acid water pollution; or

(7) that the operator has not corrected all violations which he may have committed under any prior permit and which resulted in (a) revocation of his permit, (b) forfeiture of part or all of his bond or other security, (c) conviction of a misdemeanor under Section 19, or (d) any other court order issued under Sction 19.

* Reclamation Bond

Following approval by the Division of Mining and Reclamation, and/or by the Commission as appropriate, the applicant is notified of the date of approval, the amount of reclamation bond, the date by which the bond must be posted, and the terms and conditions of the permit. Once the reclamation bond is received, a permit to mine is issued to the applicant and a copy of the approved reclamation plan is sent to the local Soil and Water Conservation District.

Section 9 of the Act specifies the amount of performance bond required for the first 25 acres. The Department may require a bond in excess of $25,000 for 25 or more acres where a greater bond is necessary to ensure reclamation and environmental protection as provided by the Act. In some instances the bond amount is quite large where mining occurs in areas of documented environmental problems or where there is a great potential for environmental degradation, such as in precious metal mining.

* Inspections

Mining operations generally are inspected by the Commission 2 to 3 times a year to esure compliance with the Mining Act, Rules and Regulations, and the approved application and reclamation plan. Section 89-10 and Section 89-28 of the Rules and Regulations give specific standards for environmental protection and land reclamation related to nonpoint source pollution. For example, Section 89-10(B) lists standards for the placement of overburden and spoil so as not to result in deposits of sediment in streams, lakes, or on adjacent property, or to interfere with proper drainage. These standards are designed to prohibit

environmental degradation or degradation of scenic values of non-permitted areas resulting from sedimentation or water pollution during mining and upon final reclamation.

Generally, a mine operator is present during an inspection at which time the site is checked for permitted acreage, adequate sediment and erosion control, adequate surface and groundwater protection, discharges of any kind, fish and wildlife disturbances, public safety, impacts on neighboring property, and reclamation. These inspections continue throughout the life of the mine and until the site has been reclaimed completely in accordance with the Rules and Regulations and the requirements of the reclamation plan. Where voluntary compliance is not achieved, the Mining Act gives the Department authority to pursue enforcement action through civil penalties, injunctive relief, permit revocation and/or bond forfeiture.

*Coordination With Other Agencies

In addition to the enforcement program, LRCC staff provides technical assistance to mine owners and operators concerning the design and installation of BMPs during mining and reclamation. The staff has the expertise to provide site specific information including design and construction of sediment and erosion control structures, hydrologic monitoring and recharge devices, wildlife protection and habitat restoration, and various types of reclamation. The Commission works very closely with other State agencies not only during the permitting process, but also in the implementation of a site-specific management plan which controls surface and groundwater nonpoint source pollution. In addition, the USDA Soil Conservation Service provides technical assistance with a wide range of conservation practices to units of government, landowners, and landusers. Many mining companies have long-range conservation plans on file with the local Soil and Water Conservation District, through which SCS provides technical assistance.

The Commission coordinates activities associated with administration of the Mining Act with the South Carolina Mining Council. This is an independent body, created by the South Carolina Legislature, with members from State government, the mining industry, non-governmental conservation interests, and water and air resource management. The Council's responsibilities include promulgating rules and regulations providing for administration of the Act and serving as the first line of appeal for any decision or determination made by the Division of Mining and Reclamation.

The Division defers matters relating to the promulgation of State water quality standards to S. C. Department of Health and Environmental Control. As part of an NPDES application, DHEC requires that a mine operator develop and implement a BMP plan that controls runoff from oil and water substances from all mines and sodium cyanide, oils, and acids from gold mines. Every NPDES permit issued for a mining operation by DHEC carries this provision. The permit requires that the permittee develop and implement the plan prior to mining and throughout the duration of the permit. When a mine closes operations, it must submit to DHEC a closure program for the mine's waste treatment facility.

* Research and Education

In addition to providing technical assistance, the Division is involved in research to develop or refine technical standards. Section 23 of the Act specifically states that the Department may cooperate with any federal, State, or local government or agency of this or any other state, in mutual programs to improve the enforcement of the Act, including research. Studies conducted by the Division relating to nonpoint source pollution include a revegetation study on deep sand mines and a contracted hydrologic investigation of sinkhole occurrence associated with the mining of limestone deposits.

Information gained from research projects is distributed to mine operators as part of an overall goal of education. Representatives from the staff

participate in seminars for mine operators to enhance knowledge of the Act and usage of best management practices. The Division has published several booklets including a handbook of recommended practices for mine operators. The staff conducts technical programs for radio, television, civic groups and schools to improve public awareness of mining. Members of the Division regularly attend conferences and workshops to gain information on various aspects of mining and reclamation.

Nonpoint Source Management Needs

The mining program has some specific needs regarding nonpoint source management. With an overall increase in mining permit applications, including precious metal mining, a great deal of staff time is consumed with the permit review process. One person is assigned full time to the three gold mining operations, which is barely adequate to ensure permit compliance and environmental protection. The remaining five field staff are responsible for environmental appraisals, addressing special problems, assisting in reclamation and conducting inspections on the other 480 mining operations. Additional funding for increased staff would allow the Division to conduct more inspections, particularly of mines located in environmentally sensitive areas.

Another program need is funding for research projects. Many existing and potential nonpoint source problems have been identified, but there is inadequate staff and funding to conduct in-depth investigations of these problems. With an increase in mining in sensitive areas such as wetlands along with an expansion of the gold industry, there is an additional need for technical training to ensure environmental protection and to provide technical assistance in the selection, design and installation of BMPs. A heightened emphasis would be placed on improving water quality in addition to runoff control, and to better address groundwater impacts.

The Mining Act needs to be strengthened in certain areas relating to nonpoint pollution. Some proposed amendments would include:

1. a Certificate of Exploration for test pits or other areas two acres or less requiring an abbreviated application and reclamation plan to provide for environmental protection;
2. add closure and post-closure activities to the definition of reclamation and the reclamation plan for precious and other metal mines and other mining operations which incorporate chemicals or substances which alter "natural" compositions and/or chemical complexes of mine refuse;
3. incorporate provisions for the protection of groundwater quantity;
4. incorporate provisions for the protection of significant cultural and/or historical sites;
5. incorporate provisions for the protection of wetlands;
6. give the Department authority to require Environmental Assessment for certain types of mining;
7. give the Department authority to require an Environmental (Financial) Assurance bond for certain types of mining;
8. give the Department authority to assess civil penalties for unpermitted mining operations.

The Mining Act has no jurisdiction on lands affected by mining and abandoned prior to its effective date of July 1, 1974. The abandoned mined lands inventory of 1979 located several sites with potential water quality problems but did not assess the negative impacts nor develop plans for remedial action. If staff and funding were available, an updated abandoned mined lands inventory would be conducted specifically addressing nonpoint source pollution. Once these problems were assessed, a management program would be developed to restore, vegetate, and protect water quality on these sites. At present

nonpoint pollution from abandoned mine lands is addressed through voluntary reclamation under authority of Section 8 of the Mining Act which states that an operator shall have the right to substitute an area mined in the past for an area presently being mined with the approval of the Department.

BMPs for Protecting Water Quality from Mining Activities

Because of the nature of surface mining, certain steps must be taken to remove and process the mineral resource. These activities can, to varying degrees, impact surface and groundwater quality. These impacts, which were identified in the previous section, can be addressed through pre-mine planning, implementation of a site-specific water management program, and adequate post-mining reclamation. BMPs are used in pre-mine planning to assist mining companies and mine operators in selecting the most effective means of controlling erosion and off-site sedimentation damage; preventing any condition that will have an unduly adverse effect on groundwater, surface water, wildlife, or fisheries; and achieving vegetative cover, soil stability, water and safety conditions appropriate to the area upon final reclamation. In addition, they provide design standards and practices for existing operations. BMPs are site-specific and are controlled in part by the pre- and post-mining land use(s). The selection of a particular practice, therefore, is based on the characteristics of an individual site and the potential for off-site impacts.

The following is a list of BMPs related to surface mining:

1. Aquifer Recharge - The process, area, or earth material that supplies water to an aquifer. A benefit of aquifer recharge systems is a reduction in surface runoff and discharge from the site.
2. Berm - A raised and elongated area of earth for erosion control intended to direct the flow of water.
3. Buffer Zones - Undisturbed strips or natural areas which surround a mine site and/or border streams, and can serve to reduce runoff velocities and filter sediment.
4. Channel Protectors - Protect natural or artificial channels where water velocities are high enough to erode the channel bottom or sides, constructed using protective lining of grass, gravel, riprap, or concrete.

5. Check Dams - A small dam constructed in a gully or other small watercourse to decrease the streamflow velocity, minimize channel scour, and promote deposition of sediment.
6. Contouring - Shaping of a mined surface with topography to improve appearance, retard erosion, and improve drainage.
7. Controlled Drainage - Control drainage to prevent damage to adjacent lands, soil erosion, and pollution of streams and rivers.
8. Cover Crop - Generally grasses used for short term erosion control, usually no longer than one year.
9. Cover or isolate - Material used to isolate acid producing matter from precipitation or ground water.
10. Critical Area Planting - Use of grasses or legumes to stabilize highly erodible or critically eroding areas such as stockpiles and spoil areas.
11. Debris and Contaminant Removal - Removal of oil, grease, scrap metal, abandoned machinery, or other contaminants from a reclaimed mine, or segment of mine.
12. Drainage Diversion - A ditch, channel, culvert, etc., used to divert surface run-off or streams away from the area of active mining.
13. Dust Suppressants - Chemicals or techniques used to control fugitive dust.
14. Environmental Impact Assessment - An assessment of the impacts, including nonpoint source pollution, which mining could have on the environment.
15. Excavated Sediment Pond - A water impoundment made by excavating a pit or dugout to retain sediment on a mine site.
16. Filter Berm - Temporary structures, used to reduce slope length and velocities of water across right of ways, but allows for passage of mine traffic.
17. Flocculant - A chemical used to speed up the settling of sediment.

18. Grassed Waterway or Outlet - Usually a broad and shallow channel that is shaped to required dimensions and established in erosion resistant vegetation for the stable conveyance of runoff.

19. Grasses and Legumes in Rotation - Establishing grasses and legumes or a mixture and maintaining the stand for soil stabilization as part of final reclamation.

20. Geotextiles - Synthetic netting or fabric that is used to control erosion, retain sediment and/or reduce surface runoff.

21. Grade Stabilization Structure - A structure used to control the grade and head cutting in natural or artificial channels.

22. Gravel or Outlet Structure - An auxiliary structure installed in conjunction with and as part of a diversion, interceptor, or perimeter dike, or other structure designed to temporarily detain sediment laden surface runoff.

23. Heavy Use Area Protection - protecting heavily used areas by establishing vegetative cover, by surfacing with suitable materials, or by installing needed structures.

24. Hillside Ditch - A channel with supporting ridge on the lower side constructed across the slope at definite vertical intervals and gradient, with or without vegetative barrier, to detain or control the flow of water to a protected outlet to check erosion on sloping land.

25. Interceptor Dike - A ridge of compacted soil or gravel constructed across disturbed sloping areas.

26. Land Disposal - Approved disposal of waste products or sludge through land application to assist in mined land reclamation.

27. Land Grading and Shaping - Altering the surface of the land to meet the requirements of the use after reclamation and to facilitate proper drainage.

28. Land Reclamation (Landslide Treatment) - Treating in place material, mine spoil excavated overburden, mine waste, or overburden, to reduce downslope movement.

29. Land Reclamation (Subsidence Treatment) - Treating subsidence areas to reduce the harmful effects and provide for beneficial use.

30. Land Reclamation (Toxic Discharge Control) - Control of acid or other toxic aqueous discharges from abandoned mines or mine waste.

31. Land Reclamation (Highwall Treatment) - Reducing harmful effects of highwalls in abandoned or active mined areas.

32. Land Reclamation, Abandoned Mined Land - Restoring land and water areas adversely affected by past mining practices and increasing the productivity of the areas for a beneficial use.

33. Land Reclamation, Currently Mined Land - Restoring currently mined land to an acceptable form and for a planned use.

34. Land Smoothing - Removing irregularities on the land surface by the use of special equipment.

35. Level Spreader - An outlet constructed at zero grade across the slope whereby concentrated runoff may be discharged at non-erosive velocities onto undisturbed areas stabilized by existing vegetation.

36. Lined Waterway or Outlet - A waterway or outlet having an erosion-resistant lining of concrete, stone, or other permanent material. The lined section extends up the side slopes to a designed depth. The earth above the permanent lining may be vegetated or otherwise protected.

37. Mechanical Outlet or Drop Structure - Permanent structures generally constructed of gravel, riprap, concrete, asphalt or other similar material designed to reduce higher velocity flows without causing erosion of the channel.

38. Mulching - The addition of materials (usually organic) to the land surface to curtail erosion or retain soil moisture.

39. Native Vegetation - Species of vegetation that grow and thrive in geologic areas where the soil and climate are suited to natural propagation. The use of native vegetation may be desired for certain types of reclamation.

40. Neutralization - The process of adding an acid or alkaline material to mining generated waste water to adjust its pH to a neutral position.

41. Perimeter Dike - A ridge of compacted soil constructed along the perimeter of the disturbed area.

42. Pipe Drop - A temporary pipe installed down a bank slope to convey storm runoff from the top to the bottom of the bank slope.

43. Pond - The reclamation of open pit mines as water bodies in areas where there is a high water table or an adequate water supply from streams, springs or wetlands.

44. Pondliners - Materials used for groundwater protection where chemicals are used in the mining operation.

45. Reclamation - The "reasonable rehabilitation of mined land for useful purposes, and the protection of the natural resources of the surrounding area," as defined in the South Carolina Mining Act.

46. Revegetation - Seeding or planting vegetation on land disturbed by mining activities to prevent soil erosion.

47. Riprap - Rough stones of various sizes placed compactly or irregularly to prevent erosion.

48. Sediment Barriers - Temporary barriers or diversions constructed of sandbags, straw or hay bales, brush, logs or poles, gravel or other filtering material.

49. Sediment Basins - A basin used to retain water for a certain time period to allow eroded material to settle.

50. Segmental Reclamation - Reclamation activities conducted simultaneously with mining, initiated at the earliest practicable time after completion or termination of mining on any segment of the permit area.

51. Setbacks - The distance from the outer edge of the pit to neighboring property line, normally maintained as an undisturbed buffer zone.

52. Slope Drain - Temporary or permanent structures that carry runoff down a slope preventing rill or gully erosion.

53. Soil Analysis - Analysis of a soil sample to determine its various properties and characteristics in order to prescribe appropriate fertilizer, lime, and plant material for ground stabilization.

54. Storm Drain Inlet Protection - Filters or excavated impounding areas around drop inlets to prevent sediment from entering storm drainage systems prior to permanent stabilization of disturbed area.

55. Storm Drain Outlet Protection - Energy dissipating devices and erosion resistant channel sections between drainage outlets and existing downstream channels.

56. Stream Crossings - Temporary or permanent structures placed across waterways for use by mine traffic.

57. Stream Diversion - Relocation of a stream channel away from areas affected by mining activities.

58. Streambank Stabilization - The protection of banks along creeks, streams, rivers and excavated channels from scour and erosion.

59. Structural Stabilization - The use of various structural measures to stabilize stream channels where vegetative stabilization alone is not sufficient to prevent erosion.

60. Temporary Sediment Traps - Small ponding areas that trap sediment transported by stream runoff from small disturbed areas.

61. Terracing - Construction of an earth embankment or ridge and channel across the slope at a suitable spacing and with an acceptable grade.

62. Topsoiling - Using topsoil to enhance the site's ability to support vegetation by providing a suitable growth medium.

63. Vegetative Maintenance - Regular inspection of a reclaimed area to ensure an adequate stand of vegetation and timely repairs of any eroding areas.

64. Visual Screening - The use of planted, natural and/or constructed visual barriers to minimize the adverse visual impact of a mining operation. Vegetative screens provide pround stabilization, and constructed barriers such as berms serve as diversions to manage runoff and maintain sediment on-site.

65. Waterway Drop Structure - A structure designed to stop the flow of water down a slope without causing erosion of the channel.

66. Wetlands Recharge - The use of existing wetlands to control and serve as a recharge area for noncontaminated stromwater and groundwater pumped from mined sites.

67. Wetlands Restoration - The restoration of disturbed wetlands as part of overall mine land reclamation to enhance the hydrology and habitat diversity of a mined site.

Four Year Action Plan

The following plan summarizes specific goals identified in the previous section relating to improving nonpoint source management for mining activities in South Carolina on a state-wide basis:

1. Continue to implement the regulatory provisions of the S. C. Mining Act and Rules and Regulations as they relate to NPS management program. Draft specific language for proposed amendments to the Mining Act and Rules and

Regulations to provide for more stringent authority in addressing nonpoint source pollution. (1989-91)

2. Seek funding for staff expansion to improve the enforcement of the Act, and to provide technical assistance to mine operators in the use of BMPs to control conditions that may result in surface or groundwater contamination. (1989-90)
3. Revise the publication entitled: Conservation and Reclamation for Mined Lands, A Handbook of Recommended Practices for Mining Operators. Refine these BMPs so that they are directed at improving water quality in addition to runoff control and groundwater impacts. (1990)
4. Continue to develop new BMPs to improve water quality on sites where NPDES permits are not required. (1989-1991)
5. Funding should be sought for research projects to investigate the effects on water quality resulting from mining activities in environmentally sensitive areas such as wetlands. (1990)
6. Continue to coordinate educational programs related to mining and specifically, to conduct water quality workshops in cooperation with DHEC. (1989-91)
7. Develop a monitoring plan to document the water quality impacts of abandoned mine lands and implement a management plan for remedial action. (1990-92)
8. Employ education, technical assistance, and research and demonstration projects related to voluntary BMPs on abandoned mined lands. These programs should be directed toward encouraging active mining companies to reclaim these areas as part of an ongoing reclamation effort on a voluntary basis. Refine these programs so that they are directed toward nonpoint

source and water quality control. (1989-92)

9. Develop a monitoring plan to collect and evaluate data concerning mine drainage and its effect on water quality in specific watersheds. (1990-92)
10. Participate in training sessions on the effects of different BMPs on reducing NPS pollution from active mining operations and/or reclaiming abandoned mined lands. (1989-92)

Site-Specific Management Plan

1. Design and implement a research project on the reclamation and revegetation of the mined areas and tailings impound located at the Ridgeway Gold Mining Project. The project should investigate the potential for residual chemical pollutants and evaluate BMPs for long term stabilization. (Phase 1 - 1989-90) (Phase 2 - 1990-97)
2. Seek additional funding for research on the effects of abandoned mine tailings and closure of heap leach operations on surface and ground water quality in Lancaster, Chesterfield, Kershaw, and Fairfield Counties. (1990-92)
3. Assist with the design and monitoring of a wetland restoration project on a mine site in Horry County as mitigated by the terms and conditions of the permit. Information should be collected on the impacts of this operation on water quality, hydrologic function, wildlife and vegetative community types upon final reclamation. (1989-90)

XI. LAND DISPOSAL NPS MANAGEMENT PLAN

Introduction

In South Carolina, nonpoint source problems may result from three general types of land disposal activities. They include solid waste disposal (landfills), land application of sludge and wastewater, and Individual Sewage Treatment and Disposal (ISTD) wastewater systems (septic tanks).

There are currently 161 permitted landfills in South Carolina. This total represents 75 sanitary landfills operated by counties/municipalities and 86 industrial landfills. Materials that may be disposed of in landfills include household wastes (garbage, trash, etc.), commercial or industrial waste (paper, fabric, plastic, non-hazardous chemical residues), and refuse (stumps, limbs, concrete, earth, etc.).

Land application of treated wastewater takes place at 106 sites in the State. Municipalities own 17 of these systems, and 89 are privately owned. There are approximately 50 sludge application sites Statewide. Sludge may be applied on land owned by a municipality or to privately owned land, such as cropland.

ISTD systems are a much utilized method of treatment and disposal of sewage in South Carolina. Of the 1.1 million year-round housing units in the State, 520,000 (or 47 percent) use some method of ISTD system. Large flow ISTD systems, greater than 1500 gallons per day, are used at small businesses, food service facilities, mortuaries, car washes, abortories, multiple family dwellings under single ownership, and at other facilities. Approximately 25,000 proposed new system sites are evaluated each year for suitability.

Land Disposal NPS Problems

Nonpoint source pollution impacts attributed to land application of wastewater and sludge and solid waste disposal does not appear to be a significant source of degradation in South Carolina waters. As indicated by the NPS Assessment report, only a small percentage of surface and groundwaters were affected. Assessment of these types of impacts is difficult; therefore, data are limited. Generally, these types of activities have the potential to degrade surface waters through sedimentation from land disturbing activities at landfill sites and direct runoff of contaminants from land application and landfills. Groundwater may be contaminated through leachate from these sites.

Contamination of surface waters may be attributable to ISTD system surface malfunction or the placement of final treatment, soil absorption trenches, and seasonal high watertable soils which resulted in subsurface leaching pollutants into shellfish and other surface waters. Pollution from this category of NPS has been linked to closures of coastal shellfish waters and public swimming areas, and outbreaks of waterborne illnesses. Some ISTD systems, in the past, were installed in poor soil with shallow rock, high seasonal watertables, and other restrictive barriers. They were also installed in close proximity to environmentally sensitive waters, and in other unsuitable geological conditions.

Existing Programs - Solid Waste Disposal

Regulatory authority over solid waste disposal activities resides with the Department of Health and Environmental Control Bureau of Solid and Hazardous Waste. Bureau staff provides technical assistance to municipalities, counties, and industry in designing and operating landfills in a more effective manner.

The disposal of solid waste is regulated through the domestic and industrial solid waste regulation promulgated under the authority of Section 44-1-140 of 1976 South Carolina Code of Laws and the South Carolina Pollution Control Act. These statutes require that all solid waste disposal facilities

obtain a written authorization (permit) from DHEC prior to commencing operation. Application for a permit includes submission of a comprehensive engineering report which requires use of best management practices and addresses such items as site specifications, potential pollution hazards, geological and hydrological conditions, and other relevant factors which enter into site design, construction, and operation. All permitted sites are closely monitored and inspected on a regular basis to ensure compliance with State regulations. Facilities which do not meet State standards are sent a compliance schedule to either correct deficiencies or close the site. New federal regulations governing solid waste disposal are being promulgated under. Subtitle D of the Resource Conservation Recovery Act (RCRA) which would require states to enforce stricter standards on solid waste disposal. One provision would require that all new landfills be synthetically lined to prevent leaching of materials into the groundwater. These regulations become final in January 1990, and states then have eighteen months to comply.

Recognizing the need for solid waste disposal solutions, the South Carolina legislature formed a Solid Waste Task Force. It is made up of seventeen members representing the public and private sectors and is composed of legislators, legislative appointees, and Governor's appointees. The Task Force is considering several options concerning waste recycling and resource recovery (generation of energy from waste material). One of these options is to make recycling mandatory. A tax would be charged on all non-recyclable containers.

BMPs for Protection of Water Quality from Solid Waste Disposal Activities

The following BMPs address water quality impacts of leachate migration and surface erosion and runoff. Not all of the BMPs are applicable in every situation. As technology changes, new BMPs may come into use. The list will be evaluated and updated as necessary.

1. Proper landfill siting
2. Operation and Maintenance Plan
3. Control of runoff and leachate from the site
4. Incineration with resource recovery
5. Recycling of solid waste
6. Erosion Control Plan
7. Buffers between landfills and waterbodies
8. Public education
9. Groundwater monitoring

Four Year Action Plan - Solid Waste Disposal

The Department of Health and Environmental Control Bureau of Solid and Hazardous Waste has identified the following program goals along with a time schedule for a more effective NPS management program:

1. Continue to enforce regulations and require best management practices to control NPS runoff and leachate from landfills (1898-1992)
2. Continue to provide technical assistance to landfill owners and operators (1989-1992)
3. Implement the provisions of RCRA subtitle D when finalized (1990-1992)
4. Support the recycling and resource recovery recommendations of the State Legislative Solid Waste Task Force (1990-1992)
5. Monitor surface and groundwater impacts of solid waste disposal sites (1989-1992)

Existing Programs - Land Application of Wastewater and Sludge

The DHEC Bureau of Water Pollution Control regulates the land application of treated effluent and land application of sludge through its permitting programs. The most common method of applying wastewater is by spray irrigation.

The treated effluent is sprayed through nozzles and infiltrates and/or percolates into the ground at a disposal site. Most of the water is evaporated into the atmosphere, and nutrients are taken up by plants growing on the site. State construction and operating permits are required for these facilities. The permitting group applies the criteria set forth in Minimum Site Suitability Requirements for Spray Irrigation of Domestic Wastewater which serve to protect Class GB (suitable for drinking water supply) groundwater standards. Also, the S. C. Coastal Council reviews these permits and may apply practices set forth in their Stormwater Management Guidelines.

A guidance document compiling updated Best Management Practices for land application of wastewater is being planned. The document will be developed for use for the consulting community to facilitate proper geohydrological design of land systems regarding protection of groundwater quality.

Sludge is solid, semi-solid, or liquid residue generated from a municipal, private domestic, commercial, industrial, or water supply treatment plant which is not approved as part of a point source discharge into surface waters. Wastewater sludge can be a valuable resource when properly applied to crop, forest, or disturbed land. With good management, the risks of environmental contamination are low, and in many situations land application is the most economical means for the municipality or industry to dispose of the material. A State permit is issued to the sludge applicator. The permit contains requirements for the use of BMPs to reduce NPS impacts. The criteria used is contained in Land Application of Sludge Manual, published by DHEC in 1987. The permit provisions assure that Class GB (suitable for drinking water supply) groundwater standards will not be compromised.

Due to the influx in groundwater self-monitoring submissions (current and future) for land application facilities, computerized data storage/screening and evaluation is a necessity. A mechanical groundwater data handling program will

facilitate proper data review and concurrently allow DHEC staff to prioritize efforts toward contamination prevention and corrective action at impacted sites. Such a program will be implemented during the next fiscal year.

BMPs for Protection of Water Quality from Land Application of Wastewater and Sludge

As previously mentioned, BMPs are required for these activities. Practices contained in Minimum Site Requirements for Spray Irrigation of Domestic Wastewater and Land Application of Sludge Manual generally fall into two categories:

1. Design Criteria
    a. Emergency holding pond
    b. Limit application rate to what can be absorbed according to soil conditions
    c. Soils should be tested for suitability
    d. Buffer zones
    e. Berms to control runoff
    f. Sites must be at least 200 feet from drinking water sources
    g. Temporary sludge storage facilities shall be lined to prevent seepage
    h. No application to steep slopes
2. Operation Criteria
    a. Vegetative cover at spray sites
    b. No spraying should be done during rain events, when ground is saturated, or when ground is frozen
    c. Monitoring of groundwater must be provided

Four Year Action Plan - Land Application of Wastewater and Sludge

1. Continued evaluation of land application facilities for environmental suitability stressing groundwater protection (1989-1992)
2. Develop and implement a groundwater data management program that would store, retrieve, and evaluate groundwater monitoring information (1989-1992)
3. Update land application BMPs based on the latest technology. These will be put in guidance form and made available to those constructing and operating land application facilities (1990-1992)
4. Conduct research in order to designate and prioritize geographical/geological locations around the State that require stringent groundwater pollution protection due to hydrological influences. This research would indicate the most desirable locations for land application sites (1990)
5. Promote coordination and cooperation between DHEC, U. S. Geological Survey, S. C. Water Resources Commission, S. C. Land Resources Conservation Commission, and other State and federal agencies in conducting studies and solving NPS problems from land application activities (1990-1992)

Existing Programs - On-Site Wastewater Disposal

The individual sewage treatment and disposal (ISTD) systems program is regulated by S. C. Department of Health and Environmental Control, Bureau of Environmental Health, Division of General Sanitation. Construction of ISTD systems is strictly regulated in accordance with standards set forth in State Regulation 61-56, Individual Waste Disposal Systems; State Regulation 61-56.1, License for Contractors Constructing On-Site Sewage Treatment and Disposal Systems; and State Regulation 61-57, Rules and Regulations Governing the Development of Subdivision Water Supply and Waste Disposal Systems. These

regulations govern the design, construction, and installation of ISTD systems. ISTD systems are not permitted if soil, water table, rock, and other conditions do not meet minimum site criteria. Statewide, approximately three percent of ISTD system permit applications are denied annually, but the rate increases to ten percent along the coast because of high water tables and impermeable clay soils. ISTD systems are not allowed if sewer connection is accessible, and septic tank effluent may not be discharged to any stream or other waterbody.

The Division has initiated educational and training efforts in several areas. District and county ISTD program personnel are trained and certified to identify soil texture, rock, restrictive horizons, and seasonal high water table indicators to accurately evaluate sites for system installation. Contractors must pass an examination before receiving a required license to install ISTD systems. Subdivision of land is evaluated and approved prior to sale, for the best possible method of water and sewage treatment and disposal.

ISTD system educational materials are available for public distribution and use. A booklet titled Individual Sewage Treatment and Disposal in South Carolina explains in layman's terms how a septic tank (ISTD) system works and a brochure titled Getting to Know Your Septic System explains proper maintenance procedures.

A survey procedure which identifies and prioritizes distressed communities with severe ISTD system failures has been developed by the Division. Communities may be declared an "Imminent Health Hazard," and thus become eligible to receive emergency grant funds to connect malfunctioning ISTD systems to an approved sewer system or construct innovative/alternative wastewater treatment and disposal systems.

In cooperation with the University of South Carolina, the Division is currently conducting research of conventional, alternative conventional, and innovative/alternative ISTD systems to assess their workability and to what

extent current standards and practices are not adequately protecting surface and subsurface waters. The study will also identify new technologies which will allow the use of ISTD systems on otherwise unsuitable sites. Results of the research are expected before 1992.

Due to a shortage of personnel and resources, the utilization of new technology, i.e. I/A systems, is impeded. These systems require periodic maintenance, cleaning of filters, replacement of pumps, etc. to ensure proper operation. Without additional personnel and resources to conduct a thorough maintenance and operational inspection program, the Department is unwilling to allow the installation of new I/A systems. The public is prone to abuse standard, gravity feed, conventional septic tank systems. Therefore, there also exists a need to commence issuing ISTD system operational and routine maintenance permits. However, the ability to implement such a program is restricted by the lack of available resources and manpower.

BMPs for Protection of Water Quality from ISTD Systems

Under State Regulation 61-56, implementation of criteria for site evaluation, construction, and installation of ISTD systems is mandatory. BMPs for maintenance are voluntary at this time.

1. Minimum site criteria
    a. Standards for soil texture, depth of soil to rock, and water table evaluation. If standards are not met, system may not be installed.
    b. System must be located at least 100 feet from the nearest public and 50 feet from the nearest private well and/or water impoundment.
    c. Systems not allowed where public sewer accessible for connection

d. Effluent not allowed to be discharged to surface water.

e. Enforcement of site criteria

2. Construction criteria

a. State approved tanks and pipes

b. State approved installation methods

c. Grease traps required for commercial food preparation establishments

d. Lint traps required for laundromats

e. Oil/water separators required for vehicle wash facilities

f. Proper enforcement of construction criteria

3. Maintenance BMPs

a. Limit use of garbage grinders

b. Avoid flushing chemicals down drain

c. Do not allow heavy vehicles to drive over drainfield

d. Have septic tank pumped out periodically to remove solids

e. Provide adequate surface water drainage away from drainfield

f. Avoid planting trees near drainfield

g. Conserve water

h. Education of the system user

Four Year Action Plan - Individual Sewage Treatment and Disposal Systems

1. Continue to implement ISTD system regulations (1989-1992)

2. Continue formalized training program and emphasize water quality component (1989-1992)

3. Continue the evaluation of Innovative/Alternative and alternative/conventional ISTD systems based on new technology which will have a favorable effect on water quality (1989-1992)

4. Document the effects of ISTD systems on coastal water quality (1989-1992)

5. Seek additional personnel and resources and develop an operation and maintenance program that provides follow-up inspections of systems for proper operation (1992)

XII. HYDROLOGIC/WETLANDS MODIFICATION NPS MANAGEMENT PLAN

Introduction

Hydrologic modification is defined as stream channelization, dredge and fill, flow regulation/modification, removal of riparian vegetation, streambank modification/destabilization, etc. Construction activities, when carried out in or near a waterbody or wetlands, may be included as hydrologic modification. They include construction of dams, bridges, marinas, docks, roads, pipelines, and mining activities.

By its very nature hydrologic modification is closely tied to wetlands issues in South Carolina. Because of increased residential and commercial development in the State, isolated inland areas such as Carolina Bays wetlands are undergoing rapid conversion or alteration. Coastal wetlands, however, are currently protected from such threats.

There are approximately 4,659,000[1] acres of wetlands in the State. This represents 23 percent of the total land area and comprises approximately 12 percent of wetlands in the southeastern United States. The dominant wetland types in South Carolina are intertidal emergent wetlands--saltmarshes, and palustrine forested wetlands--swamps and bottomland hardwood forests. Wetlands function as floodwater storage and as sediment traps. They provide groundwater recharge and discharge, nutrient removal, aquatic food chain support, fish and wildlife habitat, and shoreline stabilization. Wetlands are also valuable for their educational uses and their intrinsic qualities.

[1] Hefner, John M. and James D. Brown. 1984. Wetlands Trends in the Southeastern United States. Fifth Annual Meeting of the Society of Wetlands Scientists.

Hydrologic Modification NPS Problems

The major water quality problems resulting from instream hydrologic modifications are turbidity and suspended solids or sediments. These occur naturally in streams and water supplies. In excessive quantities, they can impair recreation, interfere with aquatic species, and increase the cost of water treatment for municipal and industrial purposes. Therefore, sediments in excess must be considered as a pollutant.

Any activity which disturbs or alters the stream bed or disrupts the flow of a body of water causes change in the dynamic equilibrium and hydraulic capabilities of the stream. Any alteration in the stream bed, either by dredging or filling, loosens debris and disturbs sediment which are, in turn, suspended or resuspended and transported by the stream. This results in turbidity, the cloudy condition caused by suspended particles in a liquid.

Two major problems result from turbidity and an increased load of suspended solids: (1) the degradation of water quality, and (2) the effects of the solids which have settled out. For example, turbidity is most visually obvious as an aesthetic problem, decreasing the recreational value of the water. The effects on aquatic life are also important because the depth to which light can penetrate and photosynthesis can occur is dependent on water clarity.

Pollutants other than sediment may be resuspended by activities which disturb the stream bed. Heavy metals introduced into the riverine system by industrial discharge and other sources may be present in sediment accumulation and may be resuspended by channel disturbances.

NPS pollution from hydrologic modification activities is not a serious problem in South Carolina because most of the activities are regulated by permit and the permits require BMPs. However, isolated wetlands outside the coastal zone are not under permit jurisdiction, so there may be localized problems. Classes of activities such as "agricultural" are not regulated under current

State law, but the "Swampbuster" provisions of the federal Food Security Act discourages farmers from converting wetlands to commodity cropland. If they do so, they will not be eligible for USDA program benefits.

Current Management Programs

Activities falling within the definition of hydrologic modification are heavily regulated for navigable waters in South Carolina by both State and federal programs. Before any activity under their jurisdictions takes place, authorization is required by the administering agencies.

A. State Regulatory Programs

1. State Budget and Control Board Permit for Construction in Navigable Waters

As set forth in Regulation 19-450, S. C. Code of Laws 1976, a permit issued by the South Carolina State Budget and Control Board is required for any construction, alteration, dredging, filling, flow alteration, or other activity, unless expressly exempted, when such activity involves or will involve the use of any navigable waterway of the State. On behalf of the State Budget and Control Board, the South Carolina Water Resources Commission serves as the coordinating agency in administering the permit procedures. Where applicable, issuance of the State permit may be conditioned upon approval of such additional licenses, permits, or authorization by the responsible State agencies.

In those instances where the applicant must obtain federal authorization for the U. S. Army Corps of Engineers under Sections 9, 10, 13, or other relevant provisions of the River and Harbor Act, or Section 404 of P. L. 100-4, the Clean Water Act, notice of applications are jointly issued by this federal agency and the State and no separate application is required for the State permit. Where State and federal jurisdictions coincide, application to the federal permitting agency constitutes automatic application to the State.

The Water Resources Commission is charged with notifying relevant State agencies of permit applications and seeking and evaluating such agencies' comments on the applications. Each agency is considered to be individually responsible for their area of interest. Based on the evaluation of comments from other agencies and their own findings, the Water Resources Commission may recommend denial, conditional approval, or approval of the permit to the Budget and Control Board. The Commission is prohibited from recommending a permit for any activity which the South Carolina Department of Health and Environmental Control determines would violate State Water Classification and Standards or endanger the public health or where consistency certification is denied by the S. C. Coastal Council.

The method of implementing Best Management Practices is by stipulating those erosion or sediment controls or other requirements which must be met on the permit. These controls are applied on a case-by-case basis, based on the project. A substantial number of permits are issued annually that contain specific erosion or siltation conditions requested by S. C. Department of Health and Environmental Control, S. C. Wildlife and Marine Resources Department, S. C. Coastal Council, or S. C. Water Resources Commission for protection of water quality or fish and wildlife habitat within navigable waters.

The State Budget and Control Board permit regulates all activities related to hydrologic modification. The jurisdiction excludes, however, those activities which take place beyond the navigable waters of South Carolina, i.e., those waters defined as non-navigable and those wetlands which are above the ordinary or mean high water mark of a watercourse unless such activities directly and significantly affect a State navigable waterway.

2. Coastal Council Permit

The Coastal Zone Management Act authorizes the South Carolina Coastal Council to promulgate regulations concerning hydrologic modification within the critical saltwater zone of the State's coastal counties. These regulations are set forth in the "Permitting Rules and Regulations." The South Carolina Coastal Council was created by the 1977 South Carolina Coastal Management Act to protect the quality of the coastal environment and to promote the economic and social improvement of the coastal zone and of all the people of the State. On September 29, 1977, the permitting authority of the State Budget and Control Board in the Coastal Zone of the State was transferred to the Coastal Council. After this date, no person may utilize a critical area for a use, unless expressly exempted, other than the use the critical area was devoted to on that date unless he first obtain a permit from the Coastal Council. No person shall fill, remove, dredge, drain, or erect any structure or in any way alter a critical area without such a permit. Critical areas include: (1) coastal waters, (2) tidelands, (3) beaches, and (4) beach/dune system (the area from the mean high water mark to the setback line as determined in Section 48-39-280 of the 1988 Coastal Zone Management Act). The Coastal Zone, or the area of the State under planning jurisdiction of the Coastal Council, includes all coastal waters and submerged lands seaward to the State's jurisdictional limits and all lands and waters in the counties of the State which contain one or more of the critical areas. The counties are Beaufort, Berkeley, Charleston, Colleton, Dorchester, Horry, Jasper, and Georgetown.

The regulations establish specific project standards for docks and piers; boat ramps; bulkheads and seawalls; cables, pipelines, and transmission lines; marinas; highway, road, and bridge construction; dredging and filling;

navigation channels and access canals; deposition of dredged material; sewage lagoons or impoundments; marsh impoundments for recreational commercial activities; and drainage canals or ditches. The Coastal Council has also prepared and implements "Stormwater Management Guidelines." This document is organized in two major sections. The first section describes types of activities that are regulated and the corresponding requirements and restrictions. Criteria such as location, lot coverage, and land use determine permit requirements. A chart at the end of the section summarizes the activities which require stormwater management and which BMPs and controls are required for each activity.

The second section presents basic design standards and requirements for stormwater management systems. Requirements for retention and detention systems with their corresponding design criteria are discussed. Also it outlines other best management practices necessary for managing stormwater and includes discussions on such topics as freshwater wetlands stormwater management systems and sediment and erosion control practices.

The Coastal Council regulations are very similar to the Budget and Control Board regulations and adequately regulate hydrologic modification activities which have a potential for degradation of water quality in the Coastal Zone of South Carolina. Unlike the Budget and Control Board jurisdiction, the Coastal Council program includes all waters and adjacent wetlands within the saline areas. All projects requiring State and federal permits in the Coastal Zone must be consistent with the Coastal Zone Management Program. The regulations and specific project standards provide a structure for the application of Best Management Practices.

3. DHEC 401 Certification

The DHEC Bureau of Water Pollution Control Division of Water Quality and Shellfish Sanitation reviews applications for inclusion of best management practices, when and where needed, on federal permits for certain types of activities in and around waterbodies. Section 401 of the federal Clean Water Act requires that all applicants for a federal permit or license which may result in a discharge to navigable waters obtain certification from DHEC. The certification ensures that the project will be conducted in a manner which will not violate State water quality standards. The Department issues certification for primarily three types of projects: U. S. Army Corps of Engineers Section 10 (navigation), Section 404 (dredge and fill permits/U. S. Coast Guard permits, and Federal Energy Regulatory Commission licenses for hydroelectric projects. These activities are categorized as hydrologic modification. Certification is routinely issued with conditions that become part of the federal permit or license. These conditions usually address nonpoint pollution sources, especially sediment loss and stormwater impacts to a waterbody. The Department also routinely reviews plans for highway and utility line construction. Certification conditions include that effective nonpoint control measures be implemented during and after construction to minimize sediment loss to affected waterbodies.

Although the Division has had the responsibility of permit/license certification since the program's inception, no formal regulations or program criteria were ever developed. The need to formalize the program in more detail has become evident since the Department has been criticized for not promulgating regulations. Division staff have begun developing draft regulations. When completed, staff will establish and work with an ad hoc advisory group of

individuals interested in the program to refine the draft regulations. A public hearing to solicit citizen comment will then be held the final steps in the process include DHEC Board approval and South Carolina General Assembly approval. The final regulations will be incorporated into the South Carolina Code of Laws. DHEC must also certify the Budget and Control Board permit and Coastal Council permit described above. Without that certification, those permits cannot be issued.

B. Federal Regulatory Programs

1. U. S. Army Corps of Engineers

The United States Army Corps of Engineers (Corps) is the agency most involved in issuing permits for land disturbing activities in wetlands. The Corps administers a national regulatory program (Section 404 of the Clean Water Act) aimed at controlling the discharge of dredged or fill material into waters of the United States. Waters of the United States refers to navigable waters, their tributaries, and adjacent wetlands. Activities covered under Section 404 must involve the discharge of dredge and fill material and may include piers, dams, dikes, marinas, bulkheads, utility and power transmission lines, and bank stabilization.

In addition to Section 404 of the Clean Water Act, the Corps has regulatory powers under the River and Harbor Act of 1899. Originally, this Act was administered to protect navigation and the navigation capacity of the nation's waters. In 1968, due to growing environmental concerns, the review of permit application was changed to include factors other than navigation. These additional factors were fish and wildlife, conservation, pollution, esthetics, ecology, and general public interest. Activities which may be covered under the River and Harbor Act of 1899 include piers, dams, dikes, marinas, bulkheads,

utility and power transmission lines, bank stabilization, and the discharge of dredged or fill material.

Best management practices are required for Corps Civil Works Projects as well as issued permits. These BMPs are designed primarily to minimize the impacts from the discharge of dredged or fill material into waters of the United States.

Summary

As indicated in the previous narrative, virtually all hydrologic/wetlands modification activities require some form of State or federal permit or certification with all such permits or certifications involving water quality considerations. To meet water quality objectives, best management practices are required. Some geographical areas of the State are beyond permitting jurisdiction. They will be addressed by voluntary programs. The need for regulatory programs will be investigated if voluntary programs are not working.

BMPs for Protection of Water Quality from Hydrologic/Wetlands Modification

The following BMPs are applicable for the control of hydrologic modification activities in South Carolina. Since each project and each site are unique, however, the practices should be applied on a case-by-case basis. Further, as new technologies are developed and programs change, the list may be updated.

BMPs for Dredge and Fill Activities

(Guidelines used by U. S. Army Corps of Engineers)

1. Actions concerning the location of the discharge
   a. Minimize smothering of organisms
   b. Avoid disruption of periodic water inundation patterns
   c. Select a previously used disposal site
   d. Select a disposal site with substrate similar in composition to the material being disposed
   e. Minimize extent of any plume
   f. Minimize or prevent creations of standing bodies of waters in areas of normally fluctuating water levels
2. Actions concerning the material to be discharged
   a. Maintain physiochemical conditions and reduce potency and availability of pollutants
   b. Limit solid, liquid, and gaseous components
   c. Add treatment substances
   d. Utilize chemical flocculants in diked disposal areas

3. Actions controlling the materials after discharge
    a. Reduce potential for erosion, slumping, or leaching by
        (1) using containment levees, sediment basins, and cover crops to reduce erosion
        (2) using lined containment areas to reduce leaching
    b. Cap in-place contaminated material with clean material
    c. Prevent point and nonpoint sources of pollution
    d. Time the discharge to minimize impact, especially during unusual high water flows, wind, wave, and tidal actions
4. Actions affecting the method of dispersion
    a. Maintain natural substrate contours and elevation
    b. Minimize undesirable obstruction to the water current or circulation pattern
    c. Confine suspended particulate/turbidity to a small area where settling can occur
    d. Mix, dilute, and disperse the discharge
    e. Minimize water column turbidity
    f. Maintain light penetration for organisms
    g. Set limitations on the amount of material to be discharged per unit of time or volume of receiving water
5. Actions related to technology
    a. Use appropriate equipment and machinery, including protective devices
    b. Employ appropriate operation and maintenance of machinery, including training, staffing, and working procedures
    c. Use machinery and techniques designed to reduce damage to wetlands, including devices that scatter rather than mound excavated materials, machines with specially designed wheels or tracks, and the use of mats under heavy machinery to reduce compaction and rutting

d. Design access roads and channel spanning structures to accommodate fluctuating water levels and circulation patterns

e. Employ appropriate machines and methods of transport of the material for discharge

6. Actions affecting plant and animal populations

a. Avoid changes in water current and circulation patterns

b. Prevent or avoid creating habitat conducive to the development of undesirable predators or species

c. Avoid sites having unique habitat or other value, including endangered or threatened species

d. Institute habitat development and restoration

e. Avoid spawning or migration seasons and other biologically critical time periods

f. Avoid destruction of remnant natural sites within areas already affected by development

7. Actions affecting human use

a. Prevent or minimize damage to the aesthetically pleasing feature of an aquatic site, including water quality

b. Avoid disposal sites valuable as natural aquatic areas

c. Avoid seasons or period when human recreational activity associated with the aquatic site is most important

d. Avoid sites which will increase incompatible human activity or require frequent dredge or fill maintenance in remote fish and wildlife areas

e. Locate disposal site outside of the vicinity of a public water supply intake

(S. C. Coastal Council)

1. Avoid agitation dredging

BMPs for Stormwater Control or Transport

(S. C. Coastal Council Stormwater Management Guidelines)

1. Grassed swales
2. Grassed lawns
3. Rock lined ditches
4. Exfiltration trench or pipe system
5. Catch basins
6. Dry wells
7. Parking lot planting areas
8. Building setback
9. Discharge structures designed to reduce velocities
10. Use paving materials designed to allow infiltration
11. Retention and/or detention ponds

BMPs for Sediment and Erosion Control

1. Silt fences
2. Temporary check dams
3. Temporary vegetative or straw cover
4. Minimize construction roads
5. Repair erosion damage

Four Year Action Plan

The following summarizes the goals (tasks) which have been identified to reduce NPS pollution from hydrologic modification activities.

A. S. C. Budget and Control Board (through the S. C. Water Resources Commission)
   1. Continue to implement program for Permits for Construction in Navigable Waters (1989-1992)

2. Monitor Program effectiveness (1990-1992)

3. Explore avenues for expanding the permitting program to cover those waters of the State that are defined as "non-navigable"

B. S. C. Coastal Council

1. Continue to implement in-place permitting and certification procedures for hydrologic modification projects in the Coastal Zone. (1989-1992)

2. Monitor Program effectiveness (1990-1992)

3. Develop and implement public awareness programs that would aid in preventing NPS pollution in or to wetlands (1990-1992)

C. S. C. Department of Health and Environmental Control, Division of Water Quality and Shellfish Sanitation

1. Continue to implement in-place certification procedures requiring best management practices for hydrologic modification and wetlands activities (1989-1992)

2. Develop and implement formalized procedures for project certification (1989-1990)

3. Develop and implement voluntary hydrologic modification/wetlands programs to encourage the use of BMPs in areas where permitting programs are not applicable (1990-1992)

4. If it is determined that voluntary programs are not working, explore the possibility of initiating regulatory programs (1990-1992)

XIII. OTHER NONPOINT SOURCE RELATED PROGRAMS

There are several agencies and programs in the State that are indirectly involved in the NPS Management Program. These programs play an important role in South Carolina's Program by complementing existing Statewide efforts or by concentrating on specific geographic areas such as wetlands.

Charleston Harbor Estuary Citizen's Committee

The Charleston Harbor Estuary Citizen's Committee is a group of concerned individuals whose primary goals are to maintain and enhance the water quality in Charleston Harbor by raising public awareness of the sources of possible pollution such as point sources, urban stormwater runoff, and other sources of NPS pollution. There is a NPS Subcommittee whose specific interests lie in identifying problems and offering alternative solutions. A member of this subcommittee is also a member of the NPS Task Force. Recommendations of the NPS Subcommittee will be incorporated into the NPS Management Program where applicable.

Governor's Freshwater Wetlands Forum

Governor Carroll A. Campbell, Jr., of South Carolina, served as a member of the National Wetlands Policy Forum. In response to recommendations from the National Forum, Governor Campbell established a State Forum to develop a Wetlands Policy for South Carolina. His goals are to define wetlands, identify and inventory wetlands in South Carolina, and provide protection to these areas. Governor Campbell supports the National Forum goal of "No net loss of the nation's remaining wetlands base." The State Forum is comprised of

representatives from the legislature, agriculture, State regulatory agencies, industry, and environmental interest groups. Recommendations concerning NPS for the Forum will be incorporated into the NPS Management Program.

Heritage Trust

The South Carolina Heritage Trust is a program within the South Carolina Wildlife and Marine Resources Department. Its primary functions are to inventory, evaluate, and protect significant natural areas and critical sites that harbor rare or endangered species. Through donation, acquisition, or registration, the lands that are entered into the Heritage Trust Program are protected by the State and are maintained in their natural conditions. Prohibition of further development along with eliminating the application of pesticides and fertilizers on these lands significantly reduces the chances of nearby streams, rivers, lakes, estuaries, or wetlands becoming polluted by nonpoint sources.

South Carolina Sea Grant Consortium

The South Carolina Sea Grant Consortium supports research pertaining to wetlands. They provide scientific information to regulatory and management agencies as well as educational information to the general public. The Consortium is preparing educational material on the function and value of wetlands including a video tape, slide presentation, and brochure. One aspect of these educational materials will discuss how NPS pollution threatens the valuable wetlands resource. NPS funds are being used to partially finance this project. It will be utilized as part of the NPS Management Program. The S. C. Sea Grant Consortium publishes a quarterly newsletter titled Coastal Heritage. This publication has a readership of several thousand. The entire Spring 1988

issue was devoted to NPS pollution and included articles discussing NPS problems, stormwater management, and agricultural runoff.

South Carolina Water Watch

The South Carolina Water Watch Program is an intra-agency and citizen's group effort coordinated through the Governor's Office and the South Carolina Water Watch Committee. This program provides individuals with a hands-on opportunity to learn more about their water resources. The more working experience citizens have with their community's water resources, the better they can detect problems, form opinions, and express their views. The basic components of the Water Watch Program are awareness, education, and action. Through Water Watch projects, active citizens can voice their concerns to federal, State, and local officials, industry, and operators of municipal water and wastewater treatment facilities. A well informed citizenry that understands and supports pollution prevention programs and more efficient treatment facility operations acts as an early pollution detection system and helps ensure that their community dollars are being spent wisely. Most of the work performed by local groups participating in this program have consisted of water quality monitoring and assessment, although some projects have been involved with NPS pollution. These efforts have consisted of monitoring sedimentation problems in streams, reporting them to appropriate State agencies, and working with local governments in land use planning around streams. The NPS Management Program plans to utilize this group in public education and information efforts.

South Carolina Water Resources Research Institute

The South Carolina Water Resources Research Institute is a unit of Clemson University. Its objectives are to evaluate research needs, motivate and support research by qualified scientists, and provide for technology transfer. This

Institute has funded approximately five scientific studies dealing with various aspects of NPS pollution in South Carolina. Recent studies have involved pesticide runoff from tomato fields and stability of particles on steep slopes. The SCWRRI plans to continue and expand its involvement with research of NPS problems. Results of this research will be incorporated into the NPS Management Program where applicable.

DHEC Groundwater Protection Division

The Groundwater Protection Division of the Bureau of Drinking Water Protection is responsible for aquifer assessment and policy as well as permitting of underground storage tanks. Protection against underground storage tank leakage is provided through a formal permitting program (UST Program) involving geohydrological review of plans and specifications. New or replacement underground tanks for petroleum products also require underground monitoring as do existing tanks that fail leak-detection tests or show significant inventory losses. Some potential sources of contaminants do not fall within the above groups, for example accidental leaks or spills from activities that no longer take place and illegal dumping.

U. S. Geological Survey

This agency, a unit of the U. S. Department of the Interior collects water quality and flow data at 52 surface water stations located throughout the State. The data is published annually in Water Resources Data for South Carolina and is also available through EPA's STORET computerized retrieval system.

USGS is currently conducting a surface and groundwater study of certain tributaries to Lake Marion, a major reservoir in the State, in cooperation with the Santee-Cooper Public Service Authority. The study will investigate surface water quality and sediment chemistry as well as groundwater quality and flow,

both direction and velocity, in order to determine potential impacts on Lake Marion.

S. C. Wildlife and Marine Resources Department

* Stream Surveys

Stream surveys have been conducted by the Freshwater Fisheries Section of the SCWMRD since the early 1970's. The information gathered consists primarily of a list of fish species, substrate type, basic water quality data, and surrounding land use. Well over 1000 streams have been surveys primarily on a one-time basis. At present, the data is stored in a computer database, and SCWMRD staff is working to have it entered into a geographical information system (GIS). Also, methods of changing and improving collections are being investigated. When a stream is designated for action by the NPS Task Force, it would be appropriate, in many cases, for SCWMRD Freshwater Fisheries personnel to update the stream database within the existing SCWMRD program. More extensive studies could also be undertaken as a cooperative effort with DHEC and/or other appropriate agencies. If a stream is designated for NPS action in which no survey has been conducted, this would certainly be justification to do so.

* Educational Programs

Project Wild Aquatic is a national wildlife conservation educational program facilitated through State wildlife and fisheries agencies, such as SCWMRD. SCWMRD personnel conduct workshops both for elementary and secondary teachers and facilitators. In these workshops, instruction for teaching Project Wild Aquatic curricula in the classroom is given. SCWMRD personnel are currently in the process of developing some supplemental curricula to accompany

the standard workbook which are more localized to South Carolina in scope. This would be an excellent avenue through which NPS education could be provided to our teachers to pass on to our school children.

Project Learning Tree is another national program implemented by a State agency. The South Carolina Forestry Commission facilitates this program, which is primarily oriented toward education about trees. It is very similar to Project Wild Aquatic in organization and goals. It would be an excellent vehicle through which education about potential NPS problems from silvicultural activities could be provided.

The Museum Nature Center Network is a loose coalition of organizations with community education program aimed primarily, but not entirely, at students. Educational efforts can be accomplished through this network both through the participation by some of them in Project Wild Aquatic and by all through the direct programs to children. Organizations which are a part of this network include: the South Carolina Museum of Natural History, the Baruch Foundation Nature Center (USC), the Coastal Zone Education Center (USC), the Charleston Museum, the Roper Mountain Science Center, the Barrier Island Environmental Education Center, Camp Thunderbird (YMCA), Camp Greenville (YMCA), and the State Parks Naturalist Program. While the programs offered through each of these facilities are quite diverse, all offer unique opportunities to educate very different segments of South Carolina's population about NPS pollution and all of these organizations should be approached about utilizing their programs.

Additionally, there is the opportunity for personnel of the Conservation, Education, and Communications (CEC) Office of SCWMRD to work with DHEC and other agencies on the NPS Task Force to develop specialized materials to be utilized for the NPS education effort in South Carolina.

XIV. EDUCATION AND INFORMATION PROGRAMS

Unlike point source pollution which can be traced to a single source and to a specific responsible cause, nonpoint source pollution is diffuse and its contributors are ubiquitous. Contributor size ranges from thousands of acres of eroding landscape to the individual homesite. Though widespread in scope, most contributions to nonpoint source pollution can be mitigated by someone or by someones. Those who can control nonpoint source pollution are the only ones who can ultimately solve the problem. They must be identified, they must be reached, they must be made aware, and they must be educated. Only through an extensive effort of public education by nonpoint source interests will we ever eventually reach the goal of controlling this kind of pollution. Public education must be recognized as a critical requirement for any program to be successful in reducing nonpoint source pollution. Only when individuals understand the importance of clean water, what they can do, and how they can help can real advancements in nonpoint source reductions be realized.

Audience Identification

Generally, we can identify everyone as contributors to nonpoint source pollution. But more specificity is needed to target educational effort. Each category of nonpoint source pollution needs to identify those who can assist in reducing pollution from that category. Agriculture will identify the farmers, the manufacturers of farming chemicals and equipment, the distributors of farming chemicals and equipment. Construction will identify highway builders, developers, contractors, architects. Forestry will identify forest landowners and contractors. Urban runoff will identify homeowners, public officials, service station attendants, school children. And the list goes on. This is but

an example of the identification process which has be be accomplished before reaching the targeted audience.

Reaching the Audience

People are reached in a wide variety of ways. Some respond best to a broad general appeal, but others are most motivated by a more personal appeal or through the opportunity to read published material. General appeals can be made using video tapes or films for commercial or public television. Issues on a statewide or a basinwide approach could be discussed. Newspaper articles in newspapers of wide distribution could be prepared and provided. Interviews with newspaper reporters often result in informative and educational articles.

Public displays of nonpoint source material can be developed. State and county fairs can be used to display exhibits and distribute information in the form of pamphlets and brochures. South Carolina has a number of special festivals celebrating a variety of causes and events, each of which provides an opportunity for creative promotion of the nonpoint source pollution cause.

On a more personal basis, one-to-one contact with individuals, farmers for example, provide a chance for one expert, a soil scientist, to talk directly to another expert, the farmer. Trade associations and membership organizations provide excellent opportunities to discuss nonpoint source pollution and reduction techniques. Conferences, seminars, and workshops can be scheduled to provide a forum for experts to share their views with others who have the same interest. Special interest groups such as the S. C. Water Watch program welcome the opportunity to be informed and trained in environmental matters.

A citizens handbook on nonpoint source pollution would provide an opportunity for citizens to read a manual prepared in such a way as to specifically introduce them to the problems and solutions facing us. A State nonpoint source newsletter could target specific projects and activities and be

mailed to interested individuals and organizations. Organization newsletters could report on their own efforts to control nonpoint source pollution.

Awareness Programs

The initial goal of reaching the public concerning awareness is the first step. The existence of nonpoint source pollution and what it is needed to be explained. Everyone must recognize nonpoint source pollution when it is seen. They must know what it is, why it should be controlled, what damage results from uncontrolled nonpoint source pollution, and how and why it costs us. Nonpoint source pollution needs to become the concern of everyone who observes a muddy stream or river, everyone who pours waste oil or paint into a storm drain, and everyone who chemically maintains an urban or suburban yard. Only when we make the public aware of the threat of nonpoint source pollution are they likely to develop the concern needed to listen to the education.

Education

With education we will train people in the skill of effectively recognizing nonpoint source pollution and then accepting the duty and responsibility for taking appropriate action. The action may be personal control of an activity such as maintaining a good vegetative cover and stream side buffer or properly disposing of leftover chemicals, or the action may be supporting public policy which may promote or control nonpoint source pollution. Education cannot begin too soon, so a program which would introduce elementary school children to the importance of water quality and the harm produced by nonpoint source pollution should be implemented. Awards could be given to high school students for science projects which use nonpoint source pollution as the subject. Science projects may point out important new concepts in nonpoint source pollution as well as educating and informing students.

Special educational projects are expected to be developed targeted to specific watershed problems. If a particular waterbody is identified as being

impaired by certain specific activities which are nonpoint source in nature, a program of awareness and BMP implementation can be developed and targeted for that particular situation. After the development of the program, it can then be presented at public meetings and through the public media.

A core part of education is explaining and promoting best management practices as described in this Management Program. All of the various agencies and organizations described in this Program will devote efforts to the task of training the public in the proper use of appropriate BMPs.

We have described the possible contents of an ambitious public education program to effectively incorporate individual citizens into the nonpoint source management program. The extent to which this program is implemented depends in great part on future Section 319 funding. Other funds will be used as available by DHEC and other participating State and federal agencies to promote the need for nonpoint sources pollution management, but only limited success can be expected without substantial EPA participation in the budget process.

Planned Activities

Within a known NPS problem area, an audiovisual presentation will be developed which will stimulate awareness of the problem and educate viewers. After determining specific locations, causes, and sources, an informative and effective presentation focusing on these identified sources and causes will be developed. It will be aimed at residents, businesses, landowners, and local government officials. The presentation will focus on sources of NPS pollutants in the problem area and the BMPs which can be employed by the local community to aid in the possibility of re-opening these valuable resource waters. An effective 30 to 40 minute NPS educational presentation using a mix of literature, verbal, and visual media will be developed. It will be prepared for personal delivery to an audience. Needed audiovisual and related equipment to develop this presentation will be purchased.

A group of agencies including DHEC are contributing toward the production of educational material on the nature and value of wetlands by the S. C. Sea Grant Consortium. The products will include video tape presentation, slide show, and brochure. The materials will convey the message that there are a variety of wetlands types, that there are compatible and incompatible uses, and that public and private interests alike will benefit from a well defined policy and process for delineating these areas and determining the appropriateness of different types of freshwater wetlands. The materials and their availability will be promoted through the news media and other appropriate vehicles such as newsletters.

XV. CERTIFICATION OF ADEQUACY OF STATE LAWS

The State must certify that existing State laws are adequate to carry out the proposed NPS Management Program. To accomplish this, the State's Attorney General or State Water Pollution Control Agency Counsel must provide a certification that there is adequate authority or, if there is not adequate authority, a list of such addition authorities as will be necessary to implement the program and a schedule and commitment by the State to seek such authorities as expeditiously as possible.

On the following page is the Certification of Authority for the South Carolina Nonpoint Source Management Plan. This certification was provided by the Department of Health and Environmental Control's General Counsel. It certifies that existing State laws are adequate to carry out the proposed NPS Management Program.

South Carolina Department of Health and Environmental Control

2600 Bull Street
Columbia, S.C. 29201

Commissioner
Michael D. Jarrett

MEMORANDUM

September 28, 1988

TO: James A. Joy, III, Chief
Bureau of Water Pollution Control

FROM: Walton J. McLeod, III W. McLeod
General Counsel

Carlisle Roberts, Jr. CR
Staff Counsel

RE: Certification of Authority for the South Carolina Nonpoint Source Management Plan

It is our opinion that the laws of the State of South Carolina provide the Department of Health and Environmental Control adequate authority for implementation of the Nonpoint Source Management Plan.

The S.C. Pollution Control Act authorizes the Department to abate, control and prevent pollution, which is defined very broadly to include contamination of the surface water, groundwater, ambient air, soil, or land. S.C. Code Ann. §§ 48-1-20, 48-1-10, 48-1-50(9). The Department is specifically empowered to "[t]ake all action necessary or appropriate to secure to this State the benefits of the Federal Water Pollution Control Act" and all other federal or state acts concerning water pollution control. § 48-1-50(17).

The Department's broad powers also include authorization to cooperate with the U.S. Government in respect to pollution control matters [§ 48-1-50(8)], to accept, receive and administer grants or other funds for pollution control purposes [§ 48-1-50(12)], to collect and disseminate information on pollution [48-1-50(14)], and to promulgate regulations for the control and prevention of pollution (§ 48-1-30). The Department is authorized to issue orders and seek injunctions requiring the discontinuance of unlawful discharges and to assess civil and criminal penalties for violations. §§ 48-1-50(3) and (4), 48-1-220, 48-1-320, 48-1-330.

Please let us know if we can provide further information.

WJM/CR,JR/pre

XVI. FEDERAL CONSISTENCY

This Section requires that State NPS Management Programs identify any federal financial assistance programs, development projects, and activities to be reviewed by the State for their consistency with its Management Program. This assures that the project or activity is implemented in a manner which the State deems consistent with the Program. The requirement is based on Executive Order 12372, as in effect on September 17, 1983,* that replaces OMB Circular A-95, the so-called A-95 Review Process.

The procedure for implementing the consistency review process is as follows. The Environmental Protection Agency (EPA) Administrator transmits to the Office of Management and Budget and appropriate Federal agencies a list of the assistance programs, development projects, and activities which the State has identified for review once its NPS Management Plan has been finalized. Beginning no later than 60 days thereafter each federal agency is required to apply applicable procedures so that individual assistance applications and projects for the identified programs and development projects are submitted for NPS lead agency review. After receiving comments, the appropriate agencies and departments of the federal government are required to accommodate concerns the State may express about consistence of such applications or projects with the State's NPS Management Program.

* Executive Order 12372 titled "Intergovernmental Review of Federal Programs" was issued July 14, 1982. This Executive Order was subsequently amended on April 8, 1983, by Executive Order 12416 also titled "Intergovernmental Review of Federal Programs." Thus, the reference to the "Executive Order 12372, as in effect on September 17, 1983," includes the amendments added by Executive Order 12416.

For purposes of the NPS Management Program, federal development projects are those activities undertaken, authorized, permitted, or financed by the federal department, agency, or instrumentality, including natural resource management or utilization, which may impact land management practices and patterns, and which may cause the disturbance of land and/or ground cover, including the discharge or runoff of pollutants into adjacent waters which, if uncontrolled or without proper management may have an effect on the attainment or the maintenance of applicable water quality standards. The term shall include the land management activities (including the activities of Federal agency tenants, claimants, lessees, or contractors) on/at Federal installations, facilities, and lands. In South Carolina, programs and projects funded, administered, and/or permitted by such federal agencies as U. S. Department of Agriculture, Farmers Home Administration, U. S. Environmental Protection Agency, U. S. Department of Defense, U. S. Forest Service, U. S. Department of Transportation, and U. S. Department of Energy will be reviewed for consistency with the State's NPS Management Program. See Table 7 for a complete listing of agencies and specific programs/projects.

Review Process

The primary mechanism for implementation of the federal consistency process is the State Intergovernmental Review Process established pursuant to Executive Order 12372. It designates a state entity called the "State Clearinghouse" for review and coordination of federal assistance and development. The lead NPS agency in South Carolina (Department of Health and Environmental Control) will notify the Clearinghouse of its desire to review federal assistance applications for programs and projects that impact the NPS Management Program for consistency as soon as it is finalized. A copy of the list of programs and projects along with the initiating agency will be provided. The Clearinghouse will then route all assistance applications from the listed agencies and program areas to DHEC,

among others, for review and comment. If appropriate, DHEC will route the information to cooperating agencies which have a responsibility or interest in the NPS Management Program for comment. DHEC will incorporate these comments into the final consistency review comments and transmit them to the Clearinghouse.

At the same time, DHEC will submit the list to EPA. In turn, EPA will consolidate State lists and transmit them to the Office of Management and Budget and applicable federal agency headquarters. With the help of the EPA Region IV Office, DHEC will transmit copies of the list to applicable local, district, or regional, federal agency offices in order to alert them that their activities will be reviewed.

If DHEC identifies consistence conflicts between the activity and the NPS Management plan, it will immediately contact the applicant and suggest alternative measures which would allow the activity to proceed in a manner consistent with the NPS Program. If these procedures do not alleviate the inconsistency, formal comments will be submitted through the Clearinghouse. DHEC will work with the Clearinghouse to ensure that adequate conflict resolution processes and procedures are in place to resolve inconsistency issues. Procedures will be identified to allow DHEC to monitor federal activities about which it has expressed consistency concerns.

DHEC will provide for intergovernmental and public review. In cases of significant or controversial activities, the State's NPS Task Force will have input.

DHEC will update the list of activities on an annual basis, should changes be necessary. The State's annual report on NPS Program progress will include a discussion on consistency activities.

In South Carolina, the S. C. Coastal Council, the State Coastal Zone Management Agency, has established procedures to review proposed federal

activities for consistency with approved Coastal Management Programs. The Coastal Council is a cooperating NPS agency. To avoid overlap, DHEC will coordinate with the Coastal Council on consistency reviews of activities affecting both the NPS and Coastal Management Zone programs.

Federal facilities that are not in compliance with federal or State pollution abatement standards must devise a five-year pollution abatement control plan for bringing the facility into compliance. This is referred to as the A-106 Process. The State of South Carolina will participate in the A-106 Process by identifying to EPA federal facilities in the State that are now or may soon be violating State water quality standards or antidegradation standards due to NPS pollution.

Review Criteria

DHEC will apply specific criteria during reviews that are based on the content and goals of the NPS Management Plan. These criteria will be provided to all cooperating agencies for their review. The following will serve as considerations and guidelines for conducting consistency reviews.

1. The extent to which the project is consistent with the State's NPS Management Program, including the Management Program's goals, policies, programs, plans, and activities;
2. The extent to which the project will comply with applicable pollution control standards embodied in the Management Program, including:
    a. Water quality standards, including beneficial uses, the numeric and narrative criteria established to support these uses, and the State's antidegradation policy;
    b. Requirements for implementation of BMPs and other pollution control measures;

c. Any statutory, regulatory, or administrative requirements, such a permits, monitoring, or prohibition of activities under certain conditions.

3. The extent to which the project duplicates, runs counter to, or needs to be coordinated with other projects or activities affecting the area's water resources.

4. The extent to which the project may support, enhance, or contribute to the fulfillment of the State's NPS Management Program.

Table 6 presents the list of federal development project areas and agencies that the State feels will impact, either favorably or adversely, the NPS Management Program. The list contains the name of the federal agency responsible for the program, the Catalog of Federal Domestic Assistance identifier number, program title, and program description.

TABLE 6

FEDERAL PROGRAMS BELIEVED TO IMPACT THE STATE'S
NPS MANAGEMENT PROGRAM

U.S. Department of Agriculture - Agricultural Stabilization Conservation Service (Technical assistance for the following items is provided by the Soil Conservation Service.)

Many, if not all applicable ASCS programs are exempt from the federal consistency process (from E.O. 12372) as a result of a notice published in the Federal Register of June 24, 1983 (7 CFR 3015). They are exempted because thousands of programs between ASCS and individual landowners are carried out annually in each state. The NPS Management Program will provide input and make recommendations on ASCS conservation programs through existing review processes. Annual reviews of conservation practices and funding priorities are made by the State Conservation Review Group of which NPS staff of DHEC has membership.

U. S. Department of Agriculture - Extension Service

10.500 Cooperative Extension Service:
To provide educational materials and technical assistance in the areas of agricultural and natural resources production and marketing, rural development, etc.

U. S. Department of Agriculture - Soil Conservation Service

10.906 River Basin Surveys and Investigations:
To provide technical assistance to federal, State, and local agencies as each works to improve economic development through the planning of coordinated water and land resources programs. Primary objectives are to solve problems of erosion and sedimentation, flooding, floodplain management, and agricultural water management. In addition, protecting wetlands and floodplains, improving water quality, and other special resources is a priority.

10.901 Resource Conservation and Development:
Federal funds for technical assistance to RC&D areas in states. Technical assistance given for measures to abate NPS pollution.

10.902 Soil and Water Conservation:
Federal funds for technical assistance to agricultural landowners for BMP planning and application.

10.904 Watershed Protection and Flood Prevention:
Federal financial assistance for installing flood control and land treatment projects.

Table 6 (continued)

Farmers Home Administration

10.418 Water and Waste Disposal Systems for Rural Communities

10.419 Watershed Protection and Flood Prevention Loans:
Loan assistance to local entities in authorized watershed areas for works of improvement such as water quality management, sedimentation control, public water-based recreation, water storage, flood control, and irrigation.

U. S. Environmental Protection Agency

66.700 Pesticide Enforcement Program:
To assist states in developing and maintaining comprehensive pesticide enforcement programs, to sponsor surveillance, monitoring and analytic procedures, to encourage regulatory activities, and certify applicators of restricted use pesticides.

66.456 Comprehensive Estuarine Management:
Development of a comprehensive conservation and management program for estuaries designated by the EPA Administrator. Implementation includes basin-wide reduction of point and nonpoint source pollutants, and basin-wide resource management programs.

Note: Several other EPA programs will have NPS Program impact but are not included on this list because DHEC NPS staff will have direct input.

U. S. Department of Defense - Office of the Chief of Engineers, Department of the Army

12.110 Planning and Assistance to States:
to cooperate with any State in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land-use resources within a designated watershed.

12.100 Aquatic Plant Control:
To provide federal assistance to State and local government agencies in the control of obnoxious aquatic plants in rivers, harbors, and allied waters.

12.106 Flood Control Projects:
To reduce flood damages through projects not specifically authorized by Congress.

12.108 Snagging and Clearing for Flood Control:

12.109 Protection, Clearing, and Straightening Channels:
To restore channels for the purpose of navigation or flood control. Land acquisition for spoil disposal purposes. Selection of open-water disposal sites.

Table 6 (continued)

Note: NPS staff currently has direct input through the certification process certain Corps of Engineers licenses and permits. These include construction of dams, dikes, etc. across navigable waters as required under Section 401 of the Code of Laws; and disposal of dredged spoils into the waters of the United States pursuant to Section 404 of the Code of Laws.

Department of Transportation - Federal Aviation Administration

20.106 Location and design, construction, and maintenance of aids to air navigation. Permits and licenses for construction, operation, or alteration of airports.

20.205 Highway Planning and Construction:
To provide financial assistance to states for the development and repair of interstate highways and bridges.

Department of Energy - Federal Energy Regulatory Commission

Licenses for non-federal hydroelectric projects and primary transmission lines under Sections 3, 4, and 15 of the Federal Power Act. Certificates for the construction and operation of interstate natural gas pipeline facilities under Section 7 to the Natural Gas Act. Certificates for the construction and operation of interstate natural gas pipeline facilities including both pipelines and terminals.

U. S. Forest Service - Cooperative Forestry Assistance

10.664 Financial assistance to State Forestry or equivalent agencies to assist in advancement of forest resource management.

Proposals for forest related research to be carried out by the U. S. Forest Service Southeast Experimental Station, Charleston, South Carolina.

Interstate Commerce Commission

Authority to abandon railway lines to the extent abandonment involves trash removal and right-of-way deposition.

Nuclear Regulatory Commission

Licensing and certification of the siting, construction, and operation of nuclear power plants pursuant to the Atomic Energy Act, the ERA of 1974, and NEPA of 1969.

National Environmental Polity Act (NEPA)

XVII. FUNDING SOURCES

Federal financial support for the Nonpoint Source Control Program is authorized from six new sections established by the Water Quality Act (P. L. 100-4) to support activities related to NPS control. The Management Program and its implementation will be funded using a mix of these funding sources and financial assistance from other federal and State sources.

Currently, federal funding specifically related to this nonpoint source planning and implementation effort is addressed in Title II of the 1987 Clean Water Act amendments. These funds are made available to states through the Environmental Protection Agency. Funding authorized in Sections 319(h) and (i) for implementation of NPS management programs has not been appropriated, however. Unavailability of these funds is and will be an obstacle to implementation of NPS related water quality improvements in some areas, but the State intends to carry out a successful NPS Management Program using the funding sources listed. If funding under Section 319 is ever appropriated, the South Carolina Department of Health and Environmental Control will be the lead agency in allocating the funds to the programs and agencies identified in the NPS Management Program.

Funding through programs of several agencies that have coordinating roles in the State's NPS program will be utilized to implement management strategies and best management practices. The intent of the NPS Management Program is to integrate all applicable financial and other types of assistance. A detailed listing of sources of funding follows.

I. Funding Sources Authorized in the Clean Water Act of 1987 (P. L. 100-4)

A. Section 205(j)(5)

This section of the Act provides a set-aside of one percent of the State's construction grant allotment. The Law mandates that at least

100,000 of this allotment is to be used for developing the State's NPS Assessment Report and Management Program (program development) and for implementing an approved Management Program (implementation). States may apply for and use 205(j)(5) funds to implement the Management Program after it has been approved by the Environmental Protection Agency. A forty percent match, however, is required. When the funds are used for program development, the match requirement does not apply. The Act defines implementation activities, in general terms, as "programs (including, as appropriate, regulatory and non-regulatory program for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects) to achieve implementation of best management practices." Such activities, when included in the State's Management Program shall be considered eligible implementation activities for funding. In addition, design of specific BMPs and the provision of financial assistance to individuals for the physical installation of BMPs is eligible in the case of "demonstrations." Also, financial assistance provided to municipalities and other public entities is an eligible implementation activity. EPA recommends that states earmark at least eighty percent of their 205(j)(5) allocation for implementation activities once the NPS Management Plan in approved. The South Carolina Department of Health and Environmental Health has applied for $235,290 in Fiscal Year 1988 and has developed a workplan for its expenditure. South Carolina allotments of 205(j)(5) funds through FY 1990 are known. They amount to $101,537 in FY 1989 and $121,845 in FY 1990.

B. Section 201(g)(1)

This Section, as amended, allows NPS control efforts to be financed through the Governor's twenty percent discretionary set-aside of construction grants funds. These are Title II funds that may be made available for any purpose for which a grant may be made under Section 319(h) and (i), that is to implement the NPS Management Program. Note that the Act, however, does not mandate use of the fund for NPS implementation; it only makes it available at the Governor's discretion. Construction Grants funding, including the set-aside, will not be appropriated after FY 1989.

C. Section 603(c)(2)

The CWA adds a new Title VI providing for federal capitalization grants for States for State revolving funds to be used for loans, primarily for municipal waste treatment. However, these loans may also be made for the implementation of a NPS Management Program. In South Carolina, State revolving fund loans may provide a source for funding to units of government for projects to control NPS pollution after FY 1991. Projects must be in accordance with a State's approved NPS Management Program and must appear on the State's Project Priority List. Favorable repayment schedules and interest rates are set by the State to ensure the accomplishment of the public purposes involved while protecting the integrity of the State's loan fund. Use of these funds is at the discretion of the State once the program satisfies Section 602 and Office of Municipal Pollution Control guidance.

D. Section 604(b)

Beginning in FY 1989, States must reserve each year one percent of

their State Revolving Loan Fund allotments or $100,000, whichever is greater, to carry out planning under 205(j) and 303(e). Since NPS planning activities are eligible for funding under 205(j), the 604(b) reserve is an additional source of potential funding for NPS activity. Although expenditure of these funds in South Carolina has been limited to point source Water Quality Management (208) activities. South Carolina's allocation under this provision is $103,610 for FY 1989 and $124,332 for FY 1990.

E. Section 320(g)

This Section authorizes grants to study and implement programs for estuary protection. The Governor of South Carolina has nominated Charleston Harbor for consideration under the National Estuary Program. Charleston Harbor is known to be impacted by nonpoint source pollution. If the nomination were approved, the State would be eligible for a grant to assist in research, surveys, studies, modeling, and other technical work necessary for the development of a management plan. Accordingly, this project would be consistent with the State NPS Management Program. The federal share of the program is 75 percent; however, the cost has not been determined.

F. Section 314(b)

The Clean Lakes Program provides financial assistance to States to assess lake problems, and South Carolina Department of Health and Environmental Control currently has a $64,000 grant to conduct a diagnostic feasibility study on Lake Edgar Brown. The Lake is known to be impacted by nonpoint source pollution. The Department also has applied for $100,000 to study Lake Bowen. If awarded, grant funds

will be shared with the S. C. Land Resources Commission which will model land use in the watershed and recommend BMPs to control NPS contributions. Congress has authorized but not appropriated funds for demonstration projects that would, among others, control nonpoint sources of pollution which are contributing to the degradation of water quality in lakes. If these funds are made available, the State would propose this lake as a candidate for such a demonstration project.

II. Federal Funding Sources of NPS Related Financial Assistance Programs Authorized in Legislation Other than the Clean Water Act

A. Water Resources Development Act, P. L. 93-251, Section 22

This Act allows the Army Corps of Engineers to cooperate with any State in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land use resources located within designated watersheds. The Corps will share the cost of some particular aspect of an approved project. The State must have a planning program for the development, utilization, and conservation underway or laid out in order to be eligible. This is a potential source of funding.

B. Rural Clean Water Program, P. L. 96-528

The Agricultural Stabilization Conservation service (ASCS) will provide financial and technical assistance to private landowners and users in approved project areas. The assistance is provided to the recipient in long term contracts of from three to ten years to install best management practices in order to solve critical water quality problems resulting from agricultural NPS. The project area must

reflect water quality priority concerns developed through the established water quality management process. The maximum payment allowed is $50,000. Funding from this program is being integrated into the State NPS Program.

C. Conservation Reserve Program, P. L. 99-198

This program authorizes the ASCS to make annual payments to landowners and users under a ten-year contract. The recipient agrees to implement a conservation plan developed by the local Conservation District for converting highly erobible land to less intensive use. The purpose is to reduce soil erosion and enhance water quality. In South Carolina, approximately 227,300 acres of highly erodible land have been taken out of production. A recently added feature of this program allows payments to those individuals that install "Vegetative Filter Strips". A filter strip is a 66 to 99 foot wide strip of land, formerly planted in crops, located along a waterbody to grow in grass, shrubs, or trees. They act as filters of sediment, associated, nutrients, and other pollutants. The South Carolina NPS Management Program encourages funding for filter strips. Funding through the CRP is being integrated into the State's NPS programs.

D. Agricultural Conservation Program, P. L. 96-294

This program authorizes ASCS to share in the costs of instituting BMPs and other conservation practices on agricultural land with eligible landowners. New emphasis is being placed on BMPs that improve water quality. The 1988 South Carolina ACP allocation was $2,817,026. Of this amount, $570,000 was allocated for one special water quality project. In 1989, two more special water quality projects will be

funded in the amount of $341,000. There is a possibility that this funding level will be increased. Funding from the ACP is being integrated into the State's NPS Management Program.

E. Resource Conservation and Development Loans, P. L. 87-703

This program allows the Farmers Home Administration (FMHA) to provide loan assistance to local sponsoring agencies for resource conservation and development. These loans are made to units of local government for soil and water development, conservation, control, and use facilities. This is a potential source of funding for the NPS Management Program.

F. Watershed Protection and Flood Prevention Loans, P. L. 83-566

The FMHA is authorized to make loans to local entities in authorized watershed areas for works of improvement such as water quality management, sedimentation control, public water-based recreation, water storage, flood control, and irrigation. This is a potential source of funds for the NPS Management Program.

G. Resources Conservation and Development, P. L. 97-98

The Soil Conservation Service is allowed to provide financial and technical assistance for planning and the installation of best management practices specified in the conservation plan. The purpose of the program is to conserve and improve the use of land, develop natural resources, and improve the environment in rural areas. In South Carolina, SCS provides some cost-share funds for construction contracts and funds for technical assistance. This funding is being integrated into the NPS Management Program.

H. Watershed Protection and Flood Prevention (Small Watershed Program), P. L.-566

The Soil Conservation Service is authorized to provide financial and technical assistance to State agencies, counties, municipalities, etc. in the planning, designing, and installation of a watershed improvement project. These projects are an effort to protect, develop, and utilize land and water resources in small watersheds. Financial assistance is in the form of cost-sharing funds to landowners. This source of funding will be integrated into the State's NPS Program.

II. Agricultural Credit Act (Emergency Conservation Program), P.L. 95-334

The ECP provides cost-share funds for emergency assistance to meet the critical needs of agricultural landowners due to severe drought or other natural disasters. The Act enables ASCS to make direct payments to landowners for performance of emergency conservation measures to control wind erosion on farmlands and to rehabilitate farmlands damaged by wind erosion, floods, hurricanes, or other natural disasters. The funds may also be used for water conservation or water enhancing measures during periods of severe drought. This is a potential source of funds that may be integrated into the NPS Management Program.

III. State Funding Sources

A. South Carolina State Conservation Tax Credits, Sections 12-7-615 and 12-7-617, Code of Laws of South Carolina 1976

This legislation provides state income tax credits for the purchase of conservation tillage planters and for the construction and restoration of water impoundments for the purposes of erosion and sediment control, irrigation, water supply, aquaculture, and wildlife management. Taxpayers may receive a credit of 25 percent of the cost,

to a maximum of $2,500, for the purchase or installation of these items.

The conservation tillage planter credit is a one-time credit; the water impoundment credit may be repeated. If the amount of the credits exceeds the tax liability for the year of expenditure, both may be carried over for credit against income tax in the next five succeeding taxable years.

To qualify for the credit on water impoundments, taxpayers must either obtain a construction permit (pursuant to the S. C. Dams and Reservoir Safety Act) from the S. C. Land Resources Conservation Commission or a certificate of exemption from the permit. The exemption certificate may be issued by either the LRCC or the Soil and Water Conservation District in which the impoundment is constructed. While not a true source of funding, this program serves as a financial incentive and will be integrated into the State's NPS Program.

B. Department of Energy Petroleum Violation Escrow Funds

The S. C. Land Resources Conservation Commission, through the Governor's Office, obtained $488,158 from this fund in 1988. The funds were used to purchase conservation tillage and drip irrigation installation equipment which can be rented at low cost by agricultural landowners. The LRCC has applied to the Governor's Office for $489,430 to make similar purchases in the next fiscal year. This funding source will be integrated into the NPS Program.

XVIII. PUBLIC PARTICIPATION

South Carolina's nonpoint source program is to be a cooperative effort between federal, State, and local governments; the private business sector; environmental interest groups; and the public at large. While the South Carolina Department of Health and Environmental Control is designated as the State's lead agency for nonpoint source pollution control, it is recognized that experts in many of the nonpoint source categories are found in a wide variety of organizations and in the general public. We have attempted to include and involve all interested and knowledgeable organizations and individuals. We have responded to all requests for copies of the Management Program and to all requests for personal appearances.

Copies of the Program were made available to all of the 46 local Soil and Water Conservation Districts. A NPS Task Force has been established consisting of representatives from 25 organizations. A roster of Task Force affiliations appears in Table 7. A number of Task Force meetings have been held to discuss the Program, and the Task Force will continue its input to the nonpoint source program.

The draft Management Plan was placed in each of the 12 DHEC Environmental Quality Control offices around the State for public review. A public notice was prepared and sent to four newspapers: The State (Columbia), the Greenville News, The Charleston News and Courier, and the Florence Morning News. It was also sent to approximately 400 individuals and groups that receive public notices on other Departmental matters. A copy of this public notice is exhibited in Appendix 3. It explains the purpose and content of the Program, lists where it is available for review, and explains how and when to submit

TABLE 7

NPS TASK FORCE

1. Division of Marine Resources, S. C. Wildlife and Marine Resources Department
2. U. S. Fish and Wildlife Service
3. S. C. Forestry Commission
4. U. S. Forest Service
5. Charleston District, U. S. Army Corps of Engineers
6. Department of Agricultural Engineering, Clemson University
7. Department of Fertilizer and Pesticide Control, Clemson University
8. S. C. Land Resources Conservation Commission
9. S. C. Water Resources Commission
10. S. C. Coastal Council
11. Soil Conservation Service, U. S. D. A.
12. S. C. Sea Grant Consortium
13. Division of Energy, Agriculture, and Natural Resources, Office of the Governor
14. Wildlife and Freshwater Fisheries, S. C. Wildlife and Marine Resources
15. Department of Civil Engineering, University of South Carolina
16. Agricultural Stabilization and Conservation Service, U. S. D. A.
17. Agricultural Extension Service, Clemson University
18. U. S. Geological Survey
19. State Advisory Council on Erosion and Sediment Reduction
20. S. C. Wildlife Federation
21. Bureau of Solid and Hazardous Waste, D. H. E. C.
22. Bureau of Water Pollution Control, DHEC
23. Bureau of Water Supply and Special Programs, DHEC
24. Bureau of Environmental Sanitation, DHEC

comments. The notice appeared in the above mentioned newspapers on October 10, 1988. Mailing list recipients received it on or before that date. The comment period closed on November 9, 1988, thirty days later. More than 60 copies of the Program were mailed in response to the public notice.

On December 22, 1988, the Environmental Protection Agency issued Public Notice Number 88-NPS-01-SC requesting public comment on the State of South Carolina's proposed NPS Assessment report and NPS Management Program. A copy of the public notice is included in Appendix 4. The public comment expiration date was January 22, 1989. Comments on the Program were sent to EPA for their review and forwarded to DHEC NPS staff.

Members of the DHEC NPS staff presented the Management Program to a meeting of the State Advisory Council on Erosion and Sediment Reduction. This advisory council is established pursuant to the S. C. Erosion and Sediment Reduction Act and consists of representatives from public and private organizations concerned with erosion and sediment control. Members of the Council were invited to review the draft program and provide comments. The Council consists of 27 members representing the organizations shown in Table 8.

DHEC staff members also participated in and co-sponsored a Symposium on Water Quality and Stormwater Management sponsored by the S. C. Chapter, Soil and Water Conservation Society, The S. C. Land Resources Commission, the Conservation Districts of South Carolina, and the USDA Soil Conservation Service at which more than 150 individuals were in attendance. An overview of the Management Program was presented, and the attendees were invited to request a copy for comment.

Many useful written and verbal comments have been received as a result of public participation. All comments were carefully reviewed and incorporated into the Management Program where appropriate and when possible.

TABLE 8

STATE ADVISORY COUNCIL ON EROSION AND SEDIMENT REDUCTION

1. S. C. Governor's Office
2. S. C. Association of Counties
3. Municipal Association of South Carolina
4. S. C. Association of Conservation Districts
5. Homebuilders Association of South Carolina
6. Carolina's Branch, The Associated General Contractors of America, Inc.
7. S. C. Association of Realtors
8. S. C. Chapter, American Society of Landscape Architects
9. S. C. Section, American Society of Civil Engineers
10. S. C. Chapter, American Institute of Architects
11. U. S. Army Corps of Engineers
12. U. S. D. A., Agricultural Stabilization and Conservation Service
13. S. C. Department of Highways and Public Transportation
14. S. C. Department of Education
15. State Engineer, S. C. Budget and Control Board
16. S. C. Coastal Council
17. Executive Directors' Committee, Council of Governments
18. S. C. Farm Bureau
19. S. C. State Grange
20. Agriculture and Natural Resources Committee, S. C. Senate
21. Agriculture and Natural Resources Committee, S. C. House of Representatives
22. U. S. D. A., Soil Conservation Service
23. Clemson University
24. S. C. Water Resources Commission
25. S. C. Forestry Commission
26. S. C. Forestry Association
27. S. C. Department of Health and Environmental Control

APPENDIX 1

NONPOINT SOURCE GUIDANCE

DECEMBER 1987

U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF WATER

OFFICE OF WATER REGULATIONS AND STANDARDS

WASHINGTON, D.C.

B. Development of State Management Programs

1. Introduction

State Management Programs should provide an overview of a State's NPS programs as well as a summary of what the State intends to accomplish in the next four fiscal years beginning after the date of program submission. EPA trusts that development of State Management Programs will help States move toward viable, long-range NPS management programs.

State Management Programs should be submitted by the Governor of each State, for that State or in combination with adjacent States, after notice and opportunity for public comment. State Management Programs should be submitted to the appropriate Regional NPS Coordinator by August 4, 1988.

While the Assessment Report identifies the overall dimensions of the State's NPS water quality problems, a State will probably find it both useful and necessary to carve out a subset of these waters in its State Management Program for concerted action on a watershed-by-watershed basis over the next four years. Such targeting will provide the greatest opportunity for achieving visible water quality improvements in the short run. In addition, States should develop Statewide program approaches to address NPS problems such as construction erosion, urban stormwater runoff from developing areas, forestry practices, or other types of NPS problems.

States are encouraged to target or identify the sequence for protecting their water resources based on a comparative evaluation of the State's waters. The guiding principles in evaluating a State's waters are to maximize environmental benefit by devoting resources and efforts to water resources in a priority order that recognizes the values of the waterbody in question, the benefits to be realized from various control actions (including evidence of local public interest and support), and the controllability of the problem(s).

States should consider the following factors in targeting NPS problem areas:

- What waterbodies are most valuable from various perspectives--aquatic habitat, recreation, and water supply for example?
- What waterbodies are subject to adverse effects from both pollution and aquatic habitat destruction (wetlands), and can be impacted by water programs?
- What tools are available to address the waterbodies identified?
- What areas are most likely to be improved through governmental action?
- Which problems are most amenable to the available tools and controls?

- What is the degree of public support (local or statewide) to protect a particular aquatic resource?

- How willing are other governmental agencies to take steps to use their tools and resources to help address the problem?

- Where would "combined actions" offer the greatest benefit relative to the value of the aquatic resource?

States are encouraged to refer to an EPA Office of Water Regulations and Standards' technical publication called Setting Priorities: The Key to Nonpoint Source Pollution Control for more details on effective NPS targeting approaches (US EPA. Office of Water Regulations and Standards, Setting Priorities: The Key to Nonpoint Source Pollution Control, July 1987). The NPS targeting strategy, as presented in this document, complements the targeting concept in the State Clean Water Strategy Guidance; more specifically, it is intended to present successful State approaches to targeting NPS water pollution control problems.

States should, where appropriate, supplement the funding of existing NPS projects in order to demonstrate the benefits of NPS projects within the four year program.

The State Management Program needs to be balanced between the priority problems the State identifies and implementation of Statewide NPS programs. Examples of Statewide NPS programs include Statewide regulations for forestry, grazing, or construction erosion control, or Statewide educational programs aimed at protecting water resources from NPS impacts. Targeted water quality projects and Statewide programs should be directed at either improving degraded water quality or preventing NPS impacts in high quality waters.

2. State Management Program Requirements

State Management Programs shall include the following six categories of information:

(A) best management practices and measures which will be used to reduce pollutant loadings resulting from each category, subcategory, or particular nonpoint source designated in the State's Assessment Report, taking into account the impact of the practice on ground-water quality.

(B) programs (including, as appropriate, nonregulatory or regulatory programs for enforcement, technical assistance, financial assistance, education, training, technology transfer, and demonstration projects) to achieve implementation of the best management practices designated under subparagraph (A).

(C) a schedule containing annual milestones for (i) utilization of the program implementation methods identified in subparagraph (B), and (ii) implementation of the the best management practices identified in subparagraph (A) by the categories,

subcategories, or particular nonpoint sources designated in the State's Assessment Report. Such schedule shall provide for utilization of the best management practices at the earliest practicable date.

(D) a certification by the attorney general of the State or States (or the chief attorney of any State water pollution control agency which has independent legal counsel) that the laws of the State or States, as the case may be, provide adequate authority to implement such management program or, if there is not adequate authority, a list of such additional authorities as will be necessary to implement such management program and a schedule and commitment by the State or States to seek such additional authorities as expeditiously as practicable.

(E) sources of Federal and other assistance and funding [other than assistance provided under subsections (h) and (i)] which will be available in each of such fiscal years for supporting implementation of such practices and measures and the purposes for which such assistance will be used in each of such fiscal years.

(F) the Federal financial assistance programs and Federal development projects for which the State will review individual assistance applications or development projects for their effect on water quality pursuant to the procedures set forth in Executive Order 12372 as in effect on September 17, 1983, to determine whether such assistance applications or development projects would be consistent with the program prepared under this subsection; for the purposes of this subparagraph, identification shall not be limited to the assistance programs or development projects subject to Executive Order 12372 but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the State's nonpoint source pollution management program.

3. *Explanation*

As required by the Act, States should develop Management Programs to the maximum extent practicable on a watershed-by-watershed basis. State NPS Management Programs should focus geographically on NPS priority areas identified through a comparative evaluation of the State's waters. Management strategies should comprehensively address the NPS problems in the watersheds targeted for implementation, regardless of landownership (Federal/State/local/private). In addition, States should develop Statewide program approaches to address various types of nonpoint sources.

The Act requires six principal categories of information to be included in State NPS Management Programs and each category as well as other items are discussed below:

Best Management Practices (BMPs) - State programs must identify the BMPs which will be used to reduce pollution from each of the categories or subcategories of NPS pollution, taking into account the

impact of the proposed practices on ground-water quality.

States are required to consider the impact of best management practices on ground water. This is due to the intimate hydrologic relationship that often exists between surface and ground water, and the possibility that measures taken to reduce contaminants in surface water runoff may increase transport of these contaminants to ground water.

The range of detail regarding BMPs in State submittals may vary from lists of BMPs which are generally considered appropriate for the various categories and subcategories of NPS pollution to detailed watershed plans. However, grant applications which seek support for specific demonstration watershed projects under sections 319 or 205(j)(5) should contain more specific information on the types and amount of BMPs needed for particular projects (see section on Demonstration Projects under Grant Application Requirements).

NPS Programs - States must identify the nonregulatory and regulatory programs including enforcement, technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring/evaluation to assist in the development and implementation of BMPs. The lead and cooperating agencies for carrying out these programs should be identified and their responsibilities clearly identified.

Section 319(h)(7) states that Federal funds from this section may be used for financial assistance to individuals only to the extent that such assistance is related to the costs of "demonstration projects." The Conference Report accompanying the Act (Report 99-1004) explains the limitations regarding "demonstration projects:"

> States may use Federal funds authorized by the bill for financial assistance to individuals only insofar as the assistance is related to costs of implementing demonstration projects. Federal-funds are not to be used as a general subsidy or for general cost sharing to support implementation of best management practices. However, a State is not precluded from using or directing other funds for cost sharing or other incentive programs if it chooses. The term "demonstration projects" includes projects designed to educate individuals as to the use of best management practices and to demonstrate their feasibility and utility as well as research projects to establish the cost effectiveness of particular BMPs.

Schedule - State programs will include a schedule containing annual milestones for the four year program. Milestones built into the four year program will provide an opportunity to gauge effectiveness of programs and to make needed mid-course corrections. Annual work programs included in grant applications must include commitments to meet the four year Management Program. Examples of milestones include: anticipated improvements in water quality, water use or achievement of water quality standards; numbers and types of BMPs implemented;

reports completed; NPS-related laws passed; and NPS programs established.

Certification of Adequacy of State Laws - The State must certify that existing State laws are adequate to carry out the proposed program or the Management Program must contain a stated intent to seek additional needed authority. If additional legal authority is needed, the schedule for seeking such authority should be adequately expeditious to allow implementation within the four-year Management Program.

Funding Sources - The Management Program should identify sources of Federal and other assistance and funding other than that provided by sections 319(h) and (i) which will be used to carry out the State's NPS Management Program in each of the four fiscal years.

Federal Consistency - State Management Programs should identify any individual Federal financial assistance programs or Federal development projects to be reviewed by the State for their consistency with its proposed State NPS Management Program. According to the Congressional Record on January 14, 1987, this requirement is based on Executive Order 12372, as in effect on September 17, 1983*, which

> ... replaces OMB Circular A-95 and establishes procedures by which State authorities may comment upon applications for Federal assistance and Federal development projects to assure that the federally supported activities and projects are consistent with State needs and objectives. This bill assures that the provisions of the Executive order, as in effect on September 17, 1983, will be applicable to the State's implementation of this review process, with respect to its nonpoint source management program, regardless of any subsequent revisions of the Executive order. The bill also allows States to designate any Federal assistance program or development project listed in the most recent Catalog of Federal Domestic Assistance, rather than just those programs and projects subject to the current Executive Order 12372." The purpose of this provision is to allow the States to review any Federal program or project that the State determines needs to be reviewed for consistency with its nonpoint management program. This provision builds upon established procedures for State review of Federal activities. It will provide the States with an important tool to assure that proposed Federal assistance and development projects are implemented in a manner which the State deems consistent with its nonpoint source pollution management program.

**Executive Order 12372 titled "Intergovernmental Review of Federal Programs" was issued July 14, 1982. This Executive Order was subsequently amended on April 8, 1983 by Executive Order 12416 also titled "Intergovernmental Review of Federal Programs." Thus, the reference to the "Executive Order 12372, as in effect on September 17, 1983," includes the amendments added by Executive Order 12416.*

The Administrator is required to transmit to the Office of Management and Budget and appropriate Federal agencies a list of the assistance programs and development projects which each State has identified for review pursuant to the procedures set forth in Executive Order 12372, as in effect on September 17, 1983. Beginning no later than 60 days thereafter each Federal agency is required to amend applicable regulations so that individual assistance applications and projects for the identified programs and development projects are submitted for State review. In addition, the appropriate agencies and departments of the Federal Government are required to accomodate, according to the requirements and definitions of the Executive Order, concerns the State may express about consistency of such applications or projects with the State's NPS Management Program.

(Note: More detailed information on how to carry out the Federal consistency provisions is currently being developed.)

Public Notice and Opportunity for Public Comment - States should actively involve other groups with water quality and resource interests in the development of State Management Programs. In addition, the State shall provide a public notice on the availability of the State's Management Program for public review and must provide an opportunity for public comment prior to submittal to EPA. Also, within ten days of receipt of a specific Management Program, the appropriate EPA Regional Office will provide public notice that they have received such Management Program.

4. *Criteria for Approval of State Management Programs*

Following are the criteria that EPA will use in evaluating a State's Management Program:

(A) Identification of BMPs [section 319(b)(2)(A)]

- Are appropriate NPS BMPs identified for each of the categories and subcategories of nonpoint sources identified in the State's Assessment Report?
- Has the impact of these BMPs on ground-water quality been considered?

(B) Identification of needed implementation programs [section 319(b)(2)(B)]

- Are the implementation programs (i.e., education, technical/financial assistance, enforcement, etc.) to be used identified?
- Are the lead and cooperating agencies responsible for the State's NPS programs identified and are their responsibilities clearly identified?
- Are implementation programs developed on a watershed-by-watershed basis, to the extent practicable (there is

recognition that Statewide program approaches are needed to address certain NPS problems)?

- o If the NPS programs include financial assistance to individuals (cost-sharing), are the Federal 319(h) costs related only to supporting the costs of demonstration projects, as required by section 319(h)(7)?

(C) Implementation milestones [section 319(b)(2)(C)]

- o Have milestones been scheduled during the four year program to allow for implementation, evaluation of program effectiveness and any necessary mid-course corrections? For example, have goals been established for individual watersheds regarding how many BMPs will be implemented by what date or what water quality improvements are expected, or has a schedule been established for the development of certain NPS regulations?

(D) Certification of the attorney general of adequate State authority [section 319(b)(2)(D)]

- o If a State's authorities are not adequate, is there a schedule for obtaining adequate authority to support needed implementation within the timeframe of the four year section 319 program?

(E) Sources of Federal and other assistance and funding [section 319(b)(2)(E)]

- o Does the Management Program explain how State and local funds, other related EPA programs [other than 319(h) and (i)], and other Federal programs affecting NPS control will be integrated and utilized as part of an overall State NPS Management Program e.g., other EPA programs such as 314, 320, 117, etc. and other Federal agency programs such as USDA's Conservation Reserve Program?

(F) Consistency of Federal programs with State NPS requirements [section 319(b)(2)(F)]

- o Is the State's identification of Federal financial assistance programs and Federal development projects to be reviewed specific enough to allow EPA to identify the programs/projects clearly to the appropriate Federal agency?

(G) Public notice and opportunity for public comment [section 319(b)(1)]

- o Have other groups with water quality and resource interests been actively involved in the process of developing the State Management Program e.g., have fish and wildlife, recreational, agricultural, forestry, drinking water and wetlands protection agencies, etc., participated in developing the Management Program?

Appendix 2

SOUTH CAROLINA WATERBODIES IMPACTED BY NPS POLLUTION

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03040201	BIG SWAMP	FLORENCE	PD-168	11	S	N			N		S	S		I	M	DO	
03040201	BLACK CREEK	DARLINGTON	PD-021	11,41,43			S		S	N			N	I,III,IV	M,E		
03040201	BLACK CREEK	DARLINGTON	PD-025	11			S		N				N	I,IV	M,E		ALSO PT SOURCE
03040201	CATFISH CANAL	MARION	PD-321	11,41,43	S	S			N	S				I,IV	M,E		
03040201	CATFISH CANAL	MARION	PD-097	11,41,43		N			N	S				I,IV	M,E	DO	
03040201	CROOKED CREEK	MARLBORO	PD-107	11,41,43	S				N	N				I,IV	M,E	pH	
03040201	JEFFRIES CREEK	FLORENCE	PD-256	11,58		N			N					I,III,IV	M,E	DO	
03040201	JEFFRIES CREEK	DARLINGTON	PD-255	11		N			N					I	M	DO	
03040201	LAKE ROBINSON	DARLINGTON	PD-266	11					N	N				I,IV	M,E	pH	
03040201	LYNCHES LAKE	FLORENCE	PD-086A	11,41,43		N			N	S		S		I	M	DO	ALSO PT SOURCE
03040201	MIDDLE SWAMP	FLORENCE	PD-230	11		N			N				S	I	M		
03040201	PEE DEE RIVER	FLORENCE	PD-076	11			S		S		S		N	I,III,IV	M,E		
03040201	PEE DEE RIVER	DARLINGTON	PD-028	11,13			S		S		S		N	I	M		
03040201	PEE DEE RIVER	MARLBORO	PD-015	11,12					N		N			I,IV	M,E		
03040201	PEE DEE RIVER	MARLBORO	PD-012	11,12			S		S		S		N	I,III	M,E		
03040201	PEE DEE RIVER	FLORENCE	PD-236	11					N		S		S	I,IV	M,E		
03040201	PRESTWOOD LAKE	DARLINGTON	PD-268	41,43					N	N				I	M	pH	
03040201	SNAKE BRANCH	DARLINGTON	PD-258	41,43	S	S			N		S	S		I	M		
03040201	SNAKE BRANCH	DARLINGTON	PD-137	41,43					N					I	M		
03040201	THOMPSON CREEK	CHESTERFIELD		11				U			U			III,IV	E		
03040201	THREE CREEKS	MARLBORO		11,21,31				U	U					III	E		
03040202	BIG SWAMP	FLORENCE	PD-169	11	S	N			N	S		S		I	M		ALSO PT SOURCE
03040202	LICK CREEK	LANCASTER	PD-329	11,14	N									I	M		
03040202	LITTLE FORK CREEK	CHESTERFIELD	PD-215	11	N									I	M		
03040202	LITTLE LYNCHES RIVER	LANCASTER	PD-006	11	N		S		S			S	N	I	M		
03040202	LITTLE RIVER	HORRY	MD-162	41,43			S				S		N	I,III	M,E		
03040202	LYNCHES LAKE	FLORENCE	PD-087	11		N			N	S				I,VI	M,E	DO,pH	
03040202	LYNCHES LAKE	FLORENCE	PD-085	11,41,43		N			N	S		S		I	M	DO	
03040202	LYNCHES RIVER	LEE		11,41,43	U	U	U	U			U			III	E		
03040202	LYNCHES RIVER	FLORENCE	PD-041	11			S						N	I,IV	M,E		
03040202	LYNCHES RIVER	KERSHAW	PD-080	11	S		S		S		S		N	I	M		
03040202	LYNCHES RIVER	FLORENCE	PD-281	11			S						N	I,IV	M,E		
03040202	LYNCHES RIVER	CHESTERFIELD	PD-113	11	N				N				N	I,IV,V	M,E		
03040202	LYNCHES RIVER	KERSHAW	PD-009	11	S				N					I	M		
03040202	LYNCHES RIVER	KERSHAW	PD-066	11	S				N					I,III	M,E		
03040202	S BR WILDCAT CREEK	LANCASTER	PD-180	14	N				N					I	M		
03040202	SPARROW SWAMP	DARLINGTON	PD-072	11		N			N	S				I,III,IV	M,E	DO,pH	
03040202	TODD BRANCH	LANCASTER	PD-005	41,43	N				N		S			I	M	FC	
03040202	W BR WILDCAT CREEK	LANCASTER	PD-179	14	N				N					I	M		
03040204	BEAVERDAM CREEK	DILLON	PD-310	11		N			N	N		S		I	M	DO,pH	
03040204	CHINNERS MILL BRANCH	HORRY	PD-177	11		N								I	M		
03040204	LAKE SWAMP	HORRY	PD-176	11,18		N			N	S		S		I,IV	M,E		
03040204	LITTLE PEE DEE RIVER	MARION	PD-189	11		S	S		N	S			N	I,IV	M,E		

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03040204	LITTLE PEE DEE RIVER	DILLON	PD-069	11,21					N	N			S	I,III,IV,VI	M,E	pH	
03040204	LITTLE PEE DEE RIVER	MARION	PD-053	11			S		N	S			S	I,III,IV	M,E		
03040204	LITTLE PEE DEE RIVER	DILLON	PD-029E	11					N	N				I,III,IV	M,E		
03040204	MAIDEN DOWN SWAMP	MARION	PD-190	11		N			N					I	M	DO	
03040204	McLAURENS MILL POND	MARLBORO	PD-17A	11		N								I	M		
03040204	PANTHER CREEK	MARLBORO	PD-306	11		N			N	N				I	M		
03040205	BIRCH CREEK	WILLIAMSBURG	PD-213	11,18	S	S			N					I	M		
03040205	BLACK MINGO CREEK	GEORGETOWN	PD-172	11		S	S		N					I	M	DO	
03040205	BLACK RIVER	LEE	PD-186	11,41,43	S	S	U	U	N	S	U			I,III	M,E		
03040205	GREEN SWAMP	SUMTER	PD-039	11,41,43	S	S								I	M		
03040205	POCOTALIGO RIVER	SUMTER	PD-091	11,41,43	S	S	S		N				N	I	M		ALSO PT SOURCE
03040205	POCOTALIGO RIVER	CLARENDON	PD-115	11		N			N	S				I	M	DO	
03040205	POCOTALIGO RIVER	SUMTER	PD-202	11,41,43		N	S		N	S			N	I	M	DO,pH	ALSO PT SOURCE
03040205	PUDDING SWAMP	WILLIAMSBURG	PD-203	11		S			N	S				I,IV	M,E		
03040205	ROCKY BLUFF SWAMP	SUMTER	PD-201	11		S			N	N				I	M	FC,DO,pH	
03040205	SCAPE ORE SWAMP	LEE		11,43	U	U	U	U			U			III,IV	E		
03040205	TURKEY CREEK	SUMTER	PD-098	11,41,43	N	S			N		S	S		I	M	FC	
03040206	CRABTREE CREEK	HORRY	MD-158	11,41,43		N			N		S			I	M	FC,DO	
03040206	INTRACOASTAL WATERWAY	HORRY	MD-085	41,43	S	N			N		S			I,II,VI	M,E		
03040206	INTRACOASTAL WATERWAY	HORRY	MD-088	41,43	S	N								I	M	FC	
03040206	INTRACOASTAL WATERWAY	HORRY	MD-087	41,43	S	N				S				I	M	FC	
03040206	INTRACOASTAL WATERWAY	HORRY	MD-127	41,43		N	S			S			S	I	M		
03040206	INTRACOASTAL WATERWAY	HORRY	MD-089	41,43	S	N				S				I	M		
03040206	KINGSTON LAKE	HORRY	MD-107	41,43	N	N			N	S				I	M	FC,DO,pH	
03040206	WACCAMAW RIVER	HORRY	MD-136	11,18,43		N				S				I	M		
03040206	WACCAMAW RIVER	HORRY	MD-111	11,18,43		N			N	S				I	M	pH	
03040206	WACCAMAW RIVER	HORRY	MD-110	11,18,43		N			N	S				I,III,VI	M,E		
03040207	ATL SURF-CMB OUTFALLS	HORRY		41,43										III	E		81 OUTFALLS
03040207	ATL SURF-NMB 27 AVE S	HORRY		41,43										III	E		
03040207	ATL SURF-NMB 7 AVE S	HORRY		41,43										III	E		
03040207	ATL SURF-NMB MAIN STREET	HORRY		41,43										III	E		
03040207	ATL SURF-SURFSIDE 5 AVE S	HORRY		41,43										III	E		
03040207	ATL SURF-SURFSIDE 7 AVE N	HORRY		41,43										III	E		
03040207	CANE PATCH SWASH-ATL SURF	HORRY		41,43										III	E		
03040207	HOG INLET	HORRY		41,43,71	U									III	E		3 CANALS
03040207	INTRACOASTAL WATERWAY	HORRY	MD-091	11,41,43	S	N					S			I	M	FC	
03040207	LITTLE R INLET-DUNN SOUND	HORRY		90	U									III	E		SHELLFISH PROHB
03040207	MIDWAY INLET INTERIOR	GEORGETOWN		41,43,65	U									III	E		SHELLFISH PROHB
03040207	MURRELLS INLET	GEORGETOWN		41,43,71										III	E		MARINAS
03040207	NORTH INLET	GEORGETOWN		41,43,71										III	E		DEBIDUE CANALS
03040207	PAWLEYS INLET INTERIOR	GEORGETOWN		41,43,65	U									III	E		
03040207	SAMPIT RIVER	GEORGETOWN		41,43,65	U		U	U						III	E		ALSO PT SOURCE
03040207	SINGLETON SWASH	HORRY		41,43,80										III	E		GOLF RUNOFF

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03040207	TURKEY CREEK	GEORGETOWN	MD-076N	11						S				I	M		
03040207	WHITE POINT SWASH	HORRY		41,43										III	E		
03040207	WINYAH BAY	GEORGETOWN		11					U					VII	E		
03040207	WITHERS SWASH-ATL SURF	HORRY		41,43										III	E		
03050101	BEAVERDAM CREEK	YORK	CW-153	14	N				N		S			I,IV	M,E		
03050101	CROWDERS CREEK	YORK	CW-023	11,14	N		S		N		N	S		I	M	FC	ALSO PT SOURCE
03050101	LAKE WYLIE	YORK		11,65	U			U						III,IV	E		
03050101	TOOLS FORK CREEK	YORK	CW-212	11	N									I	M		
03050103	BEAR CREEK	LANCASTER	CW-151	11,14	S	S			N		S			I	M		
03050103	BEAR CREEK	LANCASTER	CW-131	41,43	N	S			N		S			I	M		
03050103	CANE CREEK	LANCASTER	CW-185	14,58	S	S			N		S			I,IV	M,E		
03050103	CATAWBA RIVER	YORK		65	U						U			III	E		ALSO PT SOURCE
03050103	FISHING CREEK	YORK	CW-029	11,14			S		S		S		N	I,IV,V,VI	M,E		
03050103	FISHING CREEK	CHESTER	CW-008	11,14			N		N				N	I,IV	M,E		
03050103	FISHING CREEK RESERVOIR	CHESTER	CW-16F	11,14	S									I	M		
03050103	GILLS CREEK	LANCASTER	CW-047	41,43	N	S			N		S			I	M		
03050103	GRASSY RUN BRANCH	CHESTER	CW-088	41,43	N				N		S	S	S	I	M		
03050103	ROCKY CREEK	CHESTER	CW-002	11,14										I,IV	M,E		
03050103	STEEL CREEK	YORK	CW-011	14	N				N		S			I	M		
03050103	STEEL CREEK	YORK	CW-009	14	N	S			N		S	S		I	M		
03050103	TWELVE MILE CREEK	LANCASTER	CW-083	14	S	S			N		N			I	M		
03050103	U. T. TO CATAWBA RIVER	YORK	CW-221	41,43	N				N					I	M	FC	
03050103	WILDCAT CREEK	YORK	CW-006	41,43	N	N								I	M		
03050104	KELLY CREEK	KERSHAW	CW-154	75			N							I	M		AB'D IND. PIT
03050104	LAKE WATEREE	FAIRFIELD	CW-208	11,14		S			N	S	S		S	I,VI	M,E		
03050104	LITTLE WATEREE CREEK	FAIRFIELD	CW-040	14	N				N		S			I	M		
03050104	WATEREE RIVER	KERSHAW,SUMTER		11,14,32			U	U			U			III	E		
03050105	BROAD RIVER	CHEROKEE	B-044	11,13,14	N		S		N		N	S	N	I	M		
03050105	BROAD RIVER	CHEROKEE	B-043	11,13,14	N				N		N			I,IV	M,E		
03050105	BROAD RIVER	CHEROKEE	B-042	11,13,14	N		N		N				N	I,III,VI	M,E		
03050105	BRUSHY CREEK	GREENVILLE	BE-009	41,43	N						N			I	M		
03050105	BULLOCKS CREEK	YORK	B-159	11,14	N				S		S			I,IV	M,E		
03050105	CHEROKEE CREEK	CHEROKEE	B-056	11,14,32	S									I,IV	M,E		
03050105	HEADWATERS OF LAKE BOWEN	SPARTANBURG	B-302	11,13,32							N			I,IV	M,E		
03050105	LAKE WELCHEL	CHEROKEE		11,14,43				U						III	E		
03050105	LAWSONS FORK CREEK	SPARTANBURG		11,32,43	U			U						III,IV	E		ALSO PT SOURCE
03050105	LIMESTONE MILL CREEK	CHEROKEE	B-128	41,43	N									I	M		
03050105	LITTLE BUCK CREEK	SPARTANBURG	B-259	14	S									I	M		
03050105	MIDDLE TYGER RIVER	GREENVILLE	B-148	11	N		N		N		N		N	I	M		
03050105	NORTH PACOLET RIVER	SPARTANBURG	B-026	11,13,32	N		S		N		N		N	I,IV	M,E		
03050105	PACOLET RIVER	SPARTANBURG	BP-001	11,13,32	S				N		S			I,IV	M,E		
03050105	PACOLET RIVER	SPARTANBURG	B-028	11,13,32					N		N			I,IV	M,E		
03050105	POTTER BRANCH	SPARTANBURG	B-191	11,13,14	N				N					I	M		

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03050105	SPIVEY CREEK	SPARTANBURG	B-103	11,14										I	M		
03050105	THICKETTY CREEK	CHEROKEE	B-062	11,14,32	S				S		S			I,IV	M,E		
03050105	THICKETTY CREEK	CHEROKEE	B-133	11,14,32					N		N			I,IV	M,E		
03050105	TYGER RIVER	SPARTANBURG	B-008	11	N						N		N	I,VI	M,E		ALSO PT SOURCE
03050106	BROAD R DIVERSION CANAL	RICHLAND	B-080	41,43	N		N		N		N		N	I,III	M,E		
03050106	BROAD RIVER	NEWBERRY	B-047	11,14,18	N				N					I	M		
03050106	BROAD RIVER	FAIRFIELD	B-236	11,14			N	S	N		N		N	I	M		
03050106	BROAD RIVER	UNION	B-046	11,14	N		S		N		N	S	N	I	M		
03050106	CRANE CREEK	RICHLAND	B-316	41,43	S									I	M		
03050106	DRY FORK CREEK	CHESTER	B-074	41,43	N				N		N			I	M		
03050106	DRY FORK CREEK	CHESTER	B-073	41,43	N				N		N			I	M		
03050106	JACKSON CREEK	FAIRFIELD		14,32,43				U						III	E		
03050106	LITTLE RIVER	FAIRFIELD	B-145	14,58					N		N			I,IV	M,E		
03050106	MENG CREEK	UNION	B-064	41,43	N									I	M		
03050106	ROSS BRANCH	YORK	B-086	41,43	N				N		N			I	M		
03050106	SANDY RIVER	CHESTER	B-075	11,14,58					N		N			I,IV	M,E		
03050106	SMITH BRANCH	RICHLAND	B-280	41,43	N		N		N		N	N	N	I,V	M,E	FC	
03050106	WINNSBORO BRANCH	FAIRFIELD	B-123	41,43	N				N					I	M	FC	
03050107	ENOREE RIVER	SPARTANBURG	BE-018	11,13,14					N		N			I	M		ALSO PT SOURCE
03050107	ENOREE RIVER	NEWBERRY	B-054	11,13,14	N		N	N	N		N		N	I	M		
03050107	FAIRFOREST CREEK	SPARTANBURG	B-020	14,32,43	N				N					I,IV	M,E	FC	
03050107	KELSEY CREEK	SPARTANBURG	B-235	41,43	N									I	M		
03050107	MITCHELL CREEK	UNION	B-199	14	N				N		N			I	M		
03050107	SOUTH TYGER RIVER	SPARTANBURG	B-263	11,14,43	N				N					I,IV	M,E		ALSO PT SOURCE
03050107	SOUTH TYGER RIVER	GREENVILLE	B-317	14	N				N		N		N	I,IV	M,E		
03050107	TYGER RIVER	SPARTANBURG	B-162	11,14,32	N				N		N	S		I,III,IV	M,E		
03050107	U.T. TO FAIRFOREST CREEK	SPARTANBURG	B-242	41,43					N		N			I	M		
03050108	BEARDS CREEK	LAURENS	B-231	11,14		S								I	M		
03050108	BRUSHY CREEK	GREENVILLE	BE-035	41,43	N				S		S			I	M		
03050108	DURBIN CREEK	GREENVILLE	B-097	11,14	N				N		N			I,IV	M,E		
03050108	ENOREE RIVER	SPARTANBURG	B-037	11,14					N		N			I,III,IV	M,E		ALSO PT SOURCE
03050108	ENOREE RIVER	SPARTANBURG	BE-024	11,14	N				N		N			I,IV	M,E		ALSO PT SOURCE
03050108	ENOREE RIVER	SPARTANBURG	B-041	11,14			N		N		N		N	I,V	M,E		ALSO PT SOURCE
03050108	ENORRE RIVER	GREENVILLE	BE-015	11,14,58					N		N			I,IV	M,E		ALSO PT SOURCE
03050108	GILDER CREEK	GREENVILLE	BE-040	11,14,43	N				S		S			I,IV	M,E		
03050108	HORSE PEN CREEK	GREENVILLE	BE-020	11,13,14	N				N					I	M		ALSO PT SOURCE
03050108	MILL CREEK	SPARTANBURG	B-038	11,14	N	N			N			N		I	M		
03050108	ROCKY CREEK	GREENVILLE	BE-007	41,43	N				N		N	N		I	M		
03050109	BROADMOUTH CREEK	ANDERSON	S-289	11,41,43		S								I,IV	M,E		
03050109	BRUSHY CREEK	ANDERSON	S-067	11,14	N									I	M		
03050109	BRUSHY CREEK	ANDERSON	S-084	11,14	N				N		N			I	M		
03050109	BUSH RIVER	NEWBERRY	S-042	11,14,18	N		S		N		N		N	I,III,IV	M,E		ALSO PT SOURCE
03050109	BUSH RIVER	NEWBERRY	S-102	11,14,18	N				N		N			I,IV	M,E		ALSO PT SOURCE

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03050109	CAMPING CREEK	NEWBERRY	S-290	11,14,18	N		N		N		N	N	N	I	M		
03050109	CLOUDS CREEK	SALUDA		11,13,18				U			U			III	E		ALSO PT SOURCE
03050109	CORONACA CREEK	GREENWOOD		14,41,43	U			U			U			III	E		ALSO PT SOURCE
03050109	EASTSIDE CREEK	GREENVILLE		32,41,43				U			U			III	E		
03050109	GEORGE'S CREEK	PICKENS	S-063	14,32	N				N		N			I,IV	M,E		
03050109	HARRIS BRANCH	SALUDA	S-293	11,14,18	N	N								I	M		
03050109	KINLEY CREEK	LEXINGTON		14,32,43				U						III	E		
03050109	LAKE GREENWOOD	GREENWOOD	S-131	11			N		N	N	N		N	I,III,IV,VI	M,E		
03050109	LAKE MURRAY HEAD WATERS	NEWBERRY	S-223	11,14,18	S	N	S		S	S		S	S	I,III,IV,VI	M,E		
03050109	LITTLE RIVER	LAURENS	S-034	11,14,43	N		N		N		S		N	I,IV,V	M,E		
03050109	LITTLE RIVER	NEWBERRY	S-099	11,14					N		N			I,IV	M,E		
03050109	LITTLE SALUDA RIVER	SALUDA		11,14,18				U			U			III,IV	E		
03050109	LORICK BRANCH	LEXINGTON	S-151	41,43	N	N			N		N	N		I	M,E		
03050109	MIDDLE BRANCH HEADWATERS	PICKENS		32,43,90				U			U			II	E		
03050109	MINE CREEK	SALUDA		11,14,21				U			U			III,IV	E		
03050109	NORTH CREEK	LAURENS	S-135	11,14	S	N			N	S		N		I,IV	M,E		
03050109	RABON CREEK	LAURENS	S-096	11,14,32					S		N			I,IV	M,E		
03050109	RAWLS CREEK	LEXINGTON	S-287	41,43	N				N		N			I,III	M,E		
03050109	REEDY RIVER	GREENVILLE	S-013	11,41,43	N				N		N		N	I,II,IV,VI	M,E		
03050109	ROCK CREEK	GREENVILLE	S-091	11,14,43	N				S					I,III	M,E		
03050109	ROCKY RIVER	ANDERSON	SV-031	41,43	S		N				S		N	I	M		
03050109	SALUDA RIVER	GREENWOOD	S-186	11,14			S		N		S		N	I,IV,VI	M,E		
03050109	SALUDA RIVER	GREENVILLE	S-007	11,14,43			S				N		N	I,II,III,IV	M,E		
03050109	SALUDA RIVER	LAURENS	S-125	11,14			N		N		N		N	I,III,IV,VI	M,E		
03050109	SALUDA RIVER	PICKENS	S-250	14,32,43							N		N	I,IV	M,E		
03050109	SALUDA RIVER	LEXINGTON	S-149	14,41,43					N					I,III	M,E		ALSO PT SOURCE
03050109	SCOTT CREEK	NEWBERRY	S-044	41,43	N				N		N			I	M	FC	
03050109	U.T. TO ENOREE RIVER	GREENVILLE	BE-001	41,43	N		N				N		N	I	M		
03050109	WEST CREEK	SALUDA	S-051	11,14,18	S									I	M		
03050110	BROAD-SALUDA-CONGAREE	RICHLAND	CSB-01L,R	41,43	N		S		N		S		N	I,III	M,E		
03050110	CEDAR CREEK	RICHLAND	C-069	14	S									I	M		
03050110	FOREST LAKE	RICHLAND	C-068	41,43							S		N	I	M		
03050110	GILLS CREEK	RICHLAND	C-001	41,43	N				N				N	I,III,VI	M,E		
03050110	MILL CREEK	RICHLAND	C-021	90						N				I	M	pH	
03050110	RED BANK CREEK	LEXINGTON	C-067	11,13,58					N	S				I,III,IV	M,E		
03050110	SAVANNAH BRANCH	LEXINGTON	C-061	41,43					N	N				I	M		
03050111	HALFWAY SWAMP	CALHOUN	C-058	11,43	S				N	S	S	N		I	M		
03050111	LAKE MARION	CLARENDON	ST-024	11,12,13			S			S			N	I,II,III,IV	M,E		POT. TOXICS
03050111	TAW CAW CREEK	CLARENDON	ST-018	41,43	N	S			N			S		I	M	FC,DO	
03050112	SANTEE RIVER	BERKELEY	ST-001	11			N		S		S		N	I,VII	M,E		
03050112	SOUTH SANTEE RIVER	GEORGETOWN	MD-639B	11	N									I	M		
03050201	COOPER RIVER	BERKELEY		11,90				U						III	E		
03050201	COOTER CREEK	CHARLESTON	MD-199	90		N	S			N			N	I	M		

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03050201	EAGLE CREEK	DORCHESTER	CSTL-099	41,43	N									I	M		
03050201	FOSTER CREEK	CHARLESTON		43,63,65	U	U	U							II	E		
03050201	GOOSE CREEK	BERKELEY	MD-114	41,43	S	N	S		N				N	I,VI	M,E	DO	
03050201	LAKE MOULTRIE	BERKELEY		90				U						III	E		
03050201	NEWMARKET CREEK	CHARLESTON		41,43										III	E		DRAINS JUNKYD
03050201	POPPERDAM CREEK	CHARLESTON		32,41,43										III	E		
03050201	SHEM CREEK	CHARLESTON	MD-071	41,43	S	S				S			S	I,V	M,E		
03050201	WANDO RIVER	CHARLESTON		32,41,43	U	U	U							II	E		
03050202	ABBAPOOLA CREEK	CHARLESTON		11,13,65										III	E		
03050202	ASHLEY RIVER	CHARLESTON	MD-052	41,43		S				S			S	I	M		ALSO PT SOURCE
03050202	ASHLEY RIVER	CHARLESTON	MD-049	41,43	S	S	S		S		S		S	I	M		ALSO PT SOURCE
03050202	ASHLEY RIVER	CHARLESTON	MD-034	41,43		S				S			N	I,II	M,E		ALSO PT SOURCE
03050202	ATL SURF-FOLLY BEACH	CHARLESTON		65	U									III	E		
03050202	BRICKYARD CREEK	CHARLESTON		41,43										III	E		DRAINS IND PK
03050202	CHANDLER CREEK	DORCHESTER		41,43,71										III	E		
03050202	CHARLESTON HARBOR	CHARLESTON	MD-165	41,43		S				S			S	I,II,III,VII	M,E		ALSO PT SOURCE
03050202	CLARK SOUND	CHARLESTON		80										III	E		SPOIL RUNOFF
03050202	CONCH CREEK	CHARLESTON		32,41,43	U									II	E		
03050202	COPAHEE SOUND	CHARLESTON		32,41,43	U									II	E		
03050202	ELLIOT CUT	CHARLESTON	MD-025	41,43		S			S		S			I	M		ALSO PT SOURCE
03050202	FOLLY RIVER	CHARLESTON		13,43,65	U	U	U							II	E		
03050202	HAMLIN CREEK	CHARLESTON		32,41,43	U									II	E		
03050202	HAMLIN SOUND	CHARLESTON		32,41,43	U									II	E		
03050202	INLET CREEK	CHARLESTON		32,41,43	U									II	E		
03050202	JAMES ISLAND CREEK	CHARLESTON	MD-122	41,43		S								I	M		
03050202	JEREMY CREEK	CHARLESTON		41,43,65	U	U								II	E		
03050202	KIAWAH RIVER	CHARLESTON		11,13,43	U	U	U							II,IV	E		
03050202	SAWMILL BRANCH	DORCHESTER		32,43,71										III	E		
03050202	STONO RIVER	CHARLESTON	MD-026	13,32,43		S	S				S		S	I,II,III,IV	M,E		ALSO PT SOURCE
03050202	SWINTON CREEK	CHARLESTON		32,41,43	U									II	E		
03050202	WAPPOO CUT	CHARLESTON		41,43										III	E		
03050202	WASSAMASSAW SWAMP	BERKELEY	CSTL-063	90		N	N		S			S	N	I,V	M,E	DO	
03050203	BULL SWAMP CREEK	LEXINGTON	E-034	11,32	N	N			N	N				I,IV	M,E	DO,pH	
03050203	LIGHTWOOD KNOT CREEK	LEXINGTON	E-101	11	S	S								I	M		
03050203	N FORK EDISTO RIVER	ORANGEBURG	E-007	11,41,43	N				N	N			N	I,II,IV	M,E		
03050203	N FORK EDISTO RIVER	AIKEN	E-091	11,13	N		S		N				N	I,IV,VI	M,E	FC	
03050203	N FORK EDISTO RIVER	ORANGEBURG	E-092	11,12			S		S	N			N	I,IV	M,E		
03050203	N FORK EDISTO RIVER	ORANGEBURG	E-099	11,12			S		N	N			N	I,IV	M,E	pH	
03050204	FIRST BRANCH	EDGEFIELD	E-001	41,43	S					S				I	M	FC,pH	LIMITED DATA
03050204	GOODLAND CREEK	ORANGEBURG	E-036	11					N	S				I,IV	M,E		
03050204	S FORK EDISTO RIVER	AIKEN	E-090	11,13,58						S	S		N	I,IV	M,E		
03050205	BOHICKET CREEK	CHARLESTON	MD-195	13,32,43	S	S	S		S				N	I,IV	M,E	FC,DO	
03050205	CHURCH CREEK	CHARLESTON		11,13,65	U									II	E		

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN								DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03050205	DAWHOO RIVER	CHARLESTON	MD-120	13		S	S		S		S		N	I	M		
03050205	EDISTO RIVER	DORCHESTER	E-014	11,13		S			N					I,III,VI	M,E		
03050205	EDISTO RIVER	ORANGEBURG	E-013	11,13,18					N	S				I	M		
03050205	EDISTO RIVER	DORCHESTER	E-015	11,13					N					I	M		
03050205	FICKLING CREEK	CHARLESTON		13		U	U							II	E		
03050205	FISHING CREEK	CHARLESTON		65	U	U								II	E		
03050205	LEADENWAH CREEK	CHARLESTON		13		U	U							II	E		
03050205	POLK SWAMP	DORCHESTER	E-016	11,13,43	N	N			N			N		I	M		ALSO PT. SOURCE
03050206	FOUR HOLE SWAMP	ORANGEBURG	E-059	11,18,32			S		N				N	I,III,IV	M,E		
03050206	GRAMLING CREEK	ORANGEBURG	E-022	11,13,18	S	N								I	M		
03050206	PROVIDENCE SWAMP	ORANGEBURG	E-051	11,13,18	N	N	N		N		S		N	I	M	DO	
03050207	LITTLE SALKEHATCHIE R	COLLETON		11,21				U						III,IV	E		
03050207	PAWLEY'S CREEK	GEORGETOWN		41,43,65										III	E		
03050207	SALKEHATCHIE RIVER	COLLETON	CSTL-006	11,13					N				N	I,IV	M,E		
03050207	SALKEHATCHIE RIVER	BARNWELL	CSTL-028	11,13,58					N				N	I,IV	M,E		
03050208	ASHEPOO RIVER	COLLETON		11,14,43			U	U						III	E		
03050208	BATTERY CREEK	BEAUFORT		41,43,63										III	E		DUMP RUNOFF
03050208	BEAUFORT RIVER	BEAUFORT	MD-002	11,13,43		N			S					I,IV	M,E		
03050208	BEAUFORT RIVER	BEAUFORT	MD-001	11,41,43		N								I,IV	M,E		
03050208	BEAUFORT RIVER	BEAUFORT	MD-004	11,13,43		N								I,IV	M,E		ALSO PT SOURCE
03050208	BROAD CREEK	BEAUFORT		41,43	U									III	E		
03050208	BROAD RIVER	BEAUFORT		11,13,90					U					IV,VII	E		
03050208	CALIBOGUE SOUND & TRIBS	BEAUFORT		13,21,43	U	U	U	U						III	E		
03050208	COLLETON RIVER	BEAUFORT		11,13	U									III,IV	E		
03050208	COOSAWHATCHIE RIVER	JASPER	CSTL-107	11,58			S		S	S			N	I,IV	M,E		
03050208	COOSAWHATCHIE RIVER	HAMPTON	CSTL-109	11	S	S	N		N	S			S	I,IV	M,E		
03050208	IRELAND CREEK	COLLETON	CSTL-044	11	S	S			N	N				I,III	M,E	DO,pH	
03050208	JENKINS CREEK	BEAUFORT		61										III	E		AT HENRYS FARM
03050208	LK WARREN ON BLACK CK	HAMPTON		11,13				U						III	E		
03050208	LUCY POINT CREEK	BEAUFORT		13	U									III	E		
03050208	NEW RIVER	BEAUFORT	MD-118	11,13,43		S				S			N	I,IV,V	M,E		
03050208	OKATIE RIVER	BEAUFORT		11,13	U									III	E		
03050208	OLD HOUSE CK-FRIPP INLET	BEAUFORT		65,90	U									III	E		SHELLFISH PROHB
03050208	POCOTALIGO RIVER	BEAUFORT	MD-007	11,13,58		S	S		N				N	I,IV,V	M,E		
03050208	PORT ROYAL SOUND & TRIBS	BEAUFORT		13,21,43	U	U	U	U						III	E		
03050208	ST HELENA SOUND	BEAUFORT		11,13,90					U					IV,VII	E		
03050208	TRENCHARDS INLET	BEAUFORT		13										III	E		
03050208	WRIGHT RIVER	JASPER		80			U							III	E		SPOIL RUNOFF
03060101	BROADWAY CREEK	ANDERSON	SV-136	11,14,18					S		N			I	M		
03060101	CONEROSS CREEK	OCONEE		11,14,32				U			U			III,IV	E		
03060101	LAKE HARTWELL	OCONEE		11,32,43				U						III,IV	E		ALSO PT SOURCE
03060101	LAKE KEOWEE	OCONEE	SV-312	14									N	I,IV	M		
03060101	LAKE KEOWEE	OCONEE	SV-311	14,32									N	I,III,IV	M,E		

NONPOINT SOURCE ASSESSMENT

WATERSHED	WATERBODY	COUNTY	STATION #	NPS CATEGORY	PARAMETERS OF CONCERN									DATA SOURCE	MONITORED/ EVALUATED	STDS. VIO.	ADDITIONAL COMMENTS
					FC	DO	TX	SS	NT	pH	TB	BO	AM				
03060101	LITTLE RIVER	OCONEE	SV-203	11,21,32		U		U	N					I,III,IV	M,E		
03060101	SIX AND TWENTY CREEK	ANDERSON	SV-181	11,18,32	N				N		S			I,IV	M,E		
03060101	THOMPSON RIVER	OCONEE		11,32,43				U			U			III	E		
03060101	TWELVE MILE CREEK	PICKENS	SV-282	11,14	N				N		S			I,IV	M		
03060101	TWELVE MILE CREEK	PICKENS	SV-015	11,14					N		S			I,III,IV	M,E		
03060101	WHITEWATER RIVER	OCONEE		14,43				U			U			IV	E		
03060102	BATTLE CREEK	OCONEE		21,32				U			U			III	E		
03060102	BEAVERDAM CREEK	OCONEE		11,14				U	U					III	E		
03060102	BRASSTOWN CREEK	OCONEE		21,32				U			U			III	E		
03060102	CHATTOOGA RIVER	OCONEE		11,13,21				U			U			III,IV	E		
03060102	CHAUGA RIVER	OCONEE		21,32				U			U			III	E		
03060102	LAKE RUSSELL	ABBEVILLE		11,14,32				U						III,IV	E		
03060102	OPOSSUM CREEK	OCONEE		21,32				U			U			III	E		
03060102	SAWNEY CREEK	ABBEVILLE	SV-052	14		S								I	M		
03060103	CLARKS HILL RES	McCORMICK		14				U			U			III	E		
03060103	LAKE SECCESSION	ABBEVILLE	SV-121	11,14,32			S		S	S			S	I,III,IV	M,E		
03060103	LAKE SECCESSION	ABBEVILLE	SV-122	11,14						S			S	I,IV	M,E		
03060103	LEGION LAKE	ABBEVILLE		11,43				U						III	E		
03060103	LITTLE RIVER	McCORMICK		14				U			U			III	E		
03060103	LONG CANE CREEK	McCORMICK	SV-318	11,14,31			S		N		S		N	I,III	M,E		
03060103	LOWER THREE RUNS CREEK	ALLENDALE	SV-175	11,13,14					N				S	I	M		
03060103	SUDLOW LAKE	AIKEN		32,58				U			U			II,IV	E		
03060106	BRIDGE CREEK	AIKEN	SV-070	11,14,58			S		S	S			N	I,IV	M,E		
03060106	HORSE CREEK	AIKEN	SV-072	41,43					N	S			S	I	M		
03060106	HORSE CREEK	AIKEN	SV-071	41,43			S		S	S			N	I	M		
03060106	HORSE CREEK	AIKEN	SV-250	41,43,58			S		S	S			N	I,IV	M,E		
03060106	HORSE CREEK POND	AIKEN	SV-096	41,43					N				S	I	M		
03060106	LITTLE HORSE CREEK	AIKEN	SV-317	11,58					N	S				I,IV	M,E		
03060106	LITTLE HORSE CREEK	AIKEN	SV-073	11					N	S			S	I,II	M,E		
03060106	SAND RIVER	AIKEN	SV-069	41,43	S				S	S			N	I	M		
03060106	STEVENS CREEK	McCORMICK		14,58				U			U			III,IV	E		
03060106	TURKEY CREEK	McCORMICK		14				U			U			III	E		
03060107	CUFFEYTOWN CREEK	McCORMICK		14,58				U			U			III,IV	E		
03060107	HARD LABOR CREEK	McCORMICK		13,14				U			U			III	E		
03060107	SAVANNAH RIVER	JASPER		41,43,80			U							III	E		SPOIL RUNOFF

LEGEND FOR TABLE

Column 1 - Watershed

The standard federal eight digit hydrologic unit was selected as the watershed designation for the assessment.

Column 2 - Waterbody

The name of the body of water, i.e., stream, river, lake, wetland, etc. that evidences real or potential adverse impacts due to NPS contributions.

Column 3 - County

The South Carolina county or counties in which the problem waterbody lies. Along with the watershed identifier, it defines the location of the waterbody.

Column 4 - Station #

The DHEC surface water quality sampling station identification number.

Column 5 - NPS Category

NPS Category represents the source of pollution affecting the problem waterbody. Category number designations are taken directly from EPA guidance:

11 - Agriculture: Non-irrigated crop production
12 - Agriculture: Irrigated crop production
13 - Agriculture: Specialty crop production
14 - Agriculture: Pastureland
18 - Agriculture: Animal holding/management
21 - Silviculture: Harvesting, reforestration, residue management
31 - Construction: Highway/road/bridge
32 - Construction: Land development
41 - Urban Runoff: Storm sewers
43 - Urban Runoff: Surface runoff
58- Resource Extraction: Abandoned gravel, sand, and clay mines
65 - Land Disposal: Individual sewage treatment and disposal systems
71 - Hydrologic/Habitatal Modification: Channelization
80 - Other
90 - Source Unknown

Column 6 - Parameters of Concern

The specific water quality indicators of NPS pollution. The waterbodies listed have exhibited exceedences of specific guidelines or standards of one or more of the parameters shown:

FC - Fecal Coliform Bacteria
DO - Dissolved Oxygen
TX - Toxic materials such as heavy metals or pesticides
SS - Suspended Solids
NT - Nutrients (phosphorus and/or nitrogen)
pH
TB - Turbidity
BO - Biological Oxygen Demand (BOD_5)
AM - Ammonia

An S in a parameter column indicates scattered exceedences of a particular parameter, N indicates numerous exceedences, and U indicates undetermined.

Column 7 - Data Source

Several sources were utilized to identify NPS problem waterbodies for purposes of the assessment:

I - DHEC's surface water quality sampling network of 543 stations. This data was retrieved form the STORET network.

II - Problem locations supplied by DHEC District Engineers.

III - Problem locations supplied by the interested public including environmental groups and water based recreation groups, etc., such as USDA Soil Conservation Service Conservation, Soil Conservation Districts, S. C. Coastal Council, S. C. Wildlife and Marine Resources Department.

IV - Computer modelling results by S.C. Land Resources Conservation Commission indicate high potential for NPS problems in the agriculture, urban runoff, or surface mining categories.

V - S.C. Water Quality Assessment 1984-1985 [305(b) Report].

VI - Data contained in America's Clean Water, the State's Nonpoint Source Assessment 1985 Appendix produced by ASIWPCA.

VII - Data contained in the National Estuarine Inventory - National Coastal Pollution Discharge Inventory by the National Oceanic and Atmospheric Administration.

Column 8 - Monitored/Evaluated

This denotes whether a problem waterbody was selected based on monitored or evaluated data.

Column 9 - Standards Violations

The State of South Carolina has set water quality standards for three of the parameters listed in the assessment; dissolved oxygen, fecal coliform bacteria, and pH. This column denotes at which waterbody one or more of these parameters had standards violations. For purposes of this Assessment, measurements of the three parameters were summed for the last two-year period of record. If 50 percent or more of the measurements exceeded the criteria of the parameter for the classification of the waterbody it was considered to be in violation of State Water Quality Standards.

Column 10 - Additional Comments

Self-explanatory.

APPENDIX 3

PUBLIC NOTICE

State of South Carolina
Department of Health and Environmental Control
Bureau of Water Pollution Control
2600 Bull Street
Columbia, South Carolina 29201
(803)734-5300

PUBLIC NOTICE NO.: 2 DATE: October 10, 1988

NOTICE TO RECEIVE PUBLIC COMMENT ON STATEWIDE NONPOINT SOURCE MANAGEMENT PROGRAM

In compliance with Section 319(b)(1) of the Clean Water Act of 1987, the Department of Health and Environmental Control has prepared a Statewide Nonpoint Source (NPS) Management Program. This document addresses the overall NPS management strategy, a waterbody priority ranking system, Best Management Practices (BMPs), NPS programs (regulatory and non-regulatory), and funding sources. NPS differs from point source pollution in that it does not emanate from a discrete source such as an effluent discharge pipe. Examples of NPS include runoff from a plowed field, construction site or parking lot, and leachate from landfills or failing septic tanks.

The NPS Management Program is to be implemented over the next four years. A waterbody priority ranking system is discussed, Best Management Practices to control or abate NPS pollution are defined, and NPS programs, both regulatory and non-regulatory, which will be used to implement the overall program are identified. Funding sources for implementation of the program are also identified.

This "draft" document is tentative and open to comment from the public. Persons wishing to comment are invited to submit same in writing within thirty (30) days of the date of this Notice to South Carolina Department of Health and Environmental Control, 2600 Bull Street, Columbia, SC 29201, ATTN: NPS Coordinator, Division of Water Quality and Shellfish Sanitation. All comments received by November 9, 1988, will be considered in the formulation of the "final" report.

Copies are available for public review at the 12 Department of Health and Environmental Control Environmental Quality Control District Offices during normal office hours. The locations of these offices are:

Appalachia I EQC Office
220 McGee Road
Anderson, SC 29621

Appalachia II EQC Office
605 North Main Street
Greenville, SC 29601

Appalachia III EQC Office
151 East Wood Street
Spartanburg, SC 29304

Catawba EQC Office
1001 West Grace Street
Lancaster, SC 29720

Central Midlands EQC Office
Pearl Lightsey Building
State Park, SC 29147

Low Country EQC Office
149 Ribaut Square
Beaufort, SC 29902

Lower Savannah EQC Office
117 Marion Street, N.E.
Aiken, SC 29801

Pee Dee EQC Office
3204 Industry Boulevard
Florence, SC 29501

Trident EQC Office
1000 Air Park Road
Charleston Hgths, SC 29418

Upper Savannah EQC Office
P-129 One Park Avenue
Greenwood, SC 29646

Waccamaw EQC Office
1705 Oak Street Plaza
Myrtle Beach, SC 29577

Wateree EQC Office
105 North Magnolia Street
Sumter, SC 29151

Please bring the foregoing to the attention of persons who you know will be interested in this matter.

APPENDIX 4

United States Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia
Attention: Ms. Beverly Ethridge
(404) 347-2126

NOTICE OF RECEIPT BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY OF, AND REQUEST FOR PUBLIC COMMENT ON, THE STATE OF SOUTH CAROLINA'S PROPOSED NONPOINT SOURCE ASSESSMENT REPORT AND MANAGEMENT PROGRAM

Public Notice No: 88-NPS-01-SC
Public Notice Issuance Date: December 22, 1988
Public Comment Expiration Date: January 22, 1989

Pursuant to Section 319 of the Clean Water Act, the U.S. Environmental Protection Agency (EPA) is hereby notifying the public of its receipt of, and requesting comments on, a proposed Nonpoint Source (NPS) Assessment Report and NPS Management Program for the State of South Carolina.

1. Background

NPS Assessment Reports identify navigable waters within the State which, without further action to control NPS pollution, will not attain or maintain water quality standards. State NPS Management Programs set forth the States' four-year plans for addressing nonpoint sources of pollution. These sources include discharges other than those through confined and discrete conveyances (such as pipes or ditches), and all agricultural stormwater discharges and irrigation return flows. Major nonpoint sources may include, for example, agricultural runoff containing pesticides and fertilizers, runoff from urban areas, and construction projects.

State NPS Assessment Reports must include the following: (a) waters within the State impacted by nonpoint sources; (b) the categories or types of nonpoint sources which contribute pollutants to these State waters; (c) the process used for identifying best management practices (BMPs) to control NPS pollution; and (d) the State and local programs for controlling nonpoint sources.

State NPS Management Programs must include the following: (a) an identification of the BMPs and measures which will be undertaken to reduce pollutant loadings; (b) an identification of the programs to achieve implementation of the BMPs; (c) a schedule containing annual milestones for program implementation; (d) a certification of the State attorney general that the laws of the State provide adequate authority to implement the program; (e) sources of federal and other assistance and funding to support implementation; and (f) an identification of federal financial assistance programs and federal development projects the State will review for consistency with its Management Program.

EPA will, within 180 days of its receipt of a proposed NPS Assessment Report or Management Program, either approve or disapprove a NPS Assessment Report or Management Program or a portion of a NPS Management Program. EPA will determine whether the criteria for program approval in Section 319(d)(2), (A)-(D) have been met. In the event that the proposed Program or portion of a Program is disapproved, the State must submit a revised Program to EPA within three months, and EPA must either approve or disapprove the Program or portion of a Program within a subsequent three month period. If EPA disapproves a proposed Assessment Report, it will allow the State an opportunity to revise the Report in accordance with EPA comments. If an approvable revised Report is not submitted to EPA in a timely fashion, EPA will, after public notice and opportunity for comment, prepare an Assessment Report for that State.

2. Public Comments

Persons wishing to comment on the State of South Carolina proposed NPS Assessment Report and NPS Management Program may do so in writing, within 30 days of the date of this public notice. Comments must be received within the 30 day period to be ensured consideration in the PEA approval or disapproval decision. All comments should include the name, address and telephone number of the commenter and a statement of the relevant facts upon which it is based.

All written comments should be submitted to EPA at the above address to the attention of Ms. Beverly Ethridge, Nonpoint Source Coordinator.

The State of South Carolina's proposed NPS Assessment Report and NPS Management Program may be reviewed at the above address between 8:30 a.m. and 4:00 p.m., Monday through Friday. Copies may be reviewed at the address shown below or copies may be requested by writing:

South Carolina Department of Health & Environmental Control
Environmental Quality Control
2600 Bull Street
Columbia, South Carolina 29201

by calling (803) 734-5228.